DC LAB 8520A

8520A
Digital Multimeter

Calibration Manual

FLUKE®

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8520A
Digital Multimeter

Calibration Manual

P/N 541995
December 1979

FLUKE®

WARRANTY

Notwithstanding any provision of any agreement the following warranty is exclusive:

The JOHN FLUKE MFG. CO., INC., warrants each instrument it manufactures to be free from defects in material and workmanship under normal use and service for the period of 1-year from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, disposable batteries (rechargeable type batteries are warranted for 90-days), or any product or parts which have been subject to misuse, neglect, accident or abnormal conditions of operations.

In the event of failure of a product covered by this warranty, John Fluke Mfg. Co., Inc., will repair and calibrate an instrument returned to an authorized Service Facility within 1 year of the original purchase; provided the warrantor's examination discloses to its satisfaction that the product was defective. The warrantor may, at its option, replace the product in lieu of repair. With regard to any instrument returned within one year of the original purchase, said repairs or replacement will be made without charge. If the failure has been caused by misuse, neglect, accident or abnormal conditions of operations, repairs will be billed at a nominal cost. In such case, an estimate will be submitted before work is started, if requested.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. JOHN FLUKE MFG. CO., INC., SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT OR OTHERWISE.

If any failure occurs, the following steps should be taken:

1. Notify the JOHN FLUKE MFG. CO., INC., or the nearest Service facility, giving full details of the difficulty, and include the Model number, type number, and serial number. On receipt of this information, service data or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the instrument, transportation prepaid. Repairs will be made at the Service Facility and the instrument returned, transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of JOHN FLUKE MFG. CO., INC., instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Fluke Technical Center.) Final claim and negotiations with the carrier must be completed by the customer.

The JOHN FLUKE MFG. CO., INC. will be happy to answer all application or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to: JOHN FLUKE MFG. CO., INC., P.O. BOX 43210, MOUNTLAKE TERRACE, WASHINGTON 98043, ATTEN: Sales Dept. For European Customers: Fluke (Nederland) B.V., Zevenheuvelenweg 53, Tilburg, The Netherlands.

* For European customers, Air Freight prepaid.

John Fluke Mfg. Co., Inc., • P.O. Box 43210 • Mountlake Terrace, Washington 98043

Rev. 9/78

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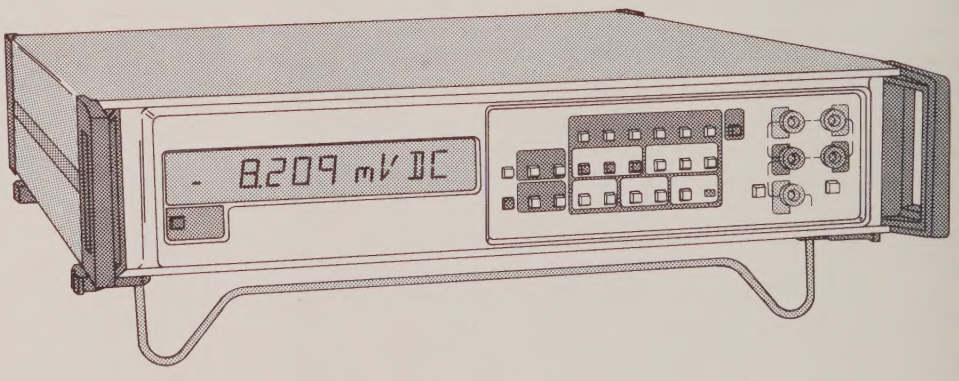


8520A Digital Multimeter

Section 1
Introduction and Specifications

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

1-1. THE 8520A INSTRUCTION MANUAL SET

1-2. The John Fluke Model 8520A Digital Multimeter is documented by a set of three manuals: the 8520A Operator's Manual, the 8520A Calibration Manual, and the 8520A Service Manual. The 8520A Operator's Manual introduces the operator to the 8520A, familarizes the operator with all instrument controls, connectors, and indicators, and presents detailed local and remote operating information and procedures. The 8520A Calibration Manual provides general maintenance procedures, Performance Tests, and Calibration Adjustment procedures. The 8520A Service Manual contains the theory of operation, troubleshooting information, a list of replaceable parts, and schematics. As Figure 1-1 shows, the three manuals can either be separated for use in different areas or joined together in a single binder.

1-3. The information in this, the 8520A Calibration Manual, is divided into six sections:

1 INTRODUCTION AND SPECIFICATIONS	Introduces the 8520A Instruction Manual Set, lists the recommended test equipment necessary to complete the Performance Tests and Calibration Adjustments, and lists the instrument specifications.
2 SHIPPING AND SERVICE INFORMATION	If there is a problem with your 8520A, how to get it corrected, and how to ship the instrument.
3 ACCESS PROCEDURES	Describes how to gain access to the Calibration Adjustments and general maintenance circuit areas.

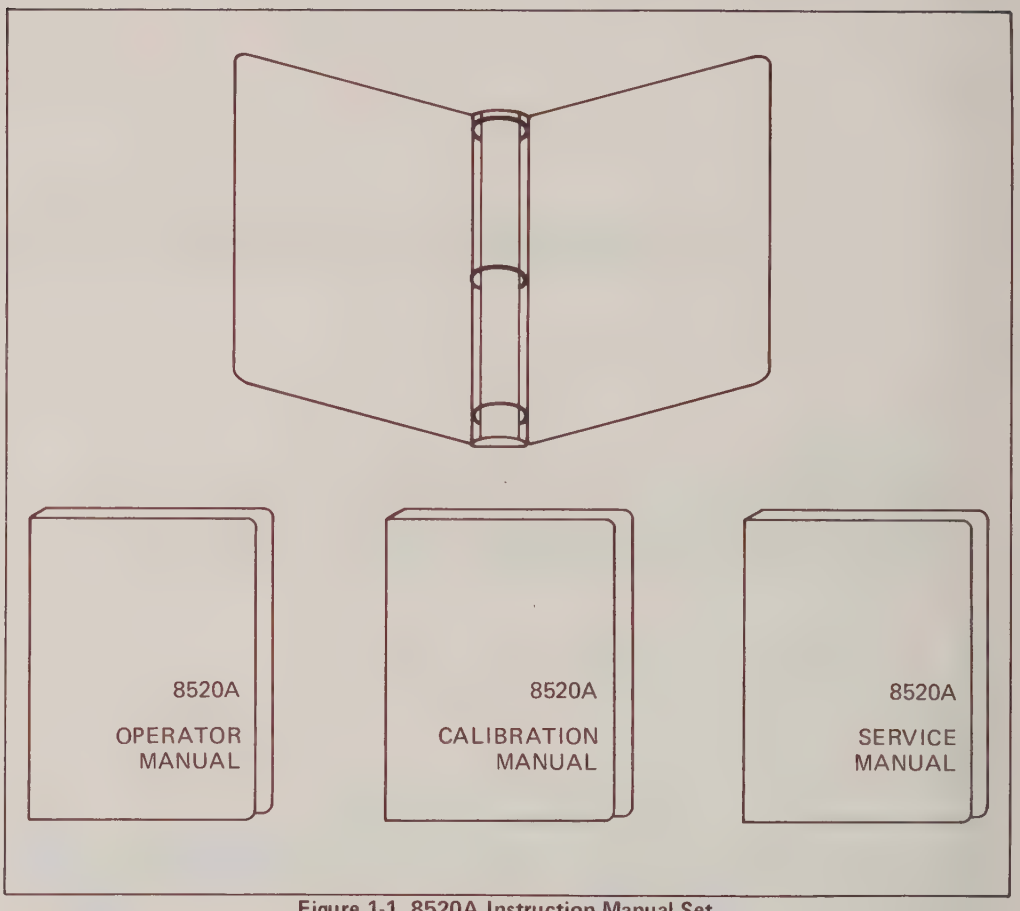


Figure 1-1. 8520A Instruction Manual Set

4 GENERAL MAINTENANCE	Describes how to replace fuses, select a different line voltage, clean the instrument, etc.
5 PERFORMANCE TESTS	A set of procedures that verify that the 8520A is performing within the specifications listed in Section I. All of these procedures are completed with the INSTRUMENT COVERS IN PLACE.
6 CALIBRATION ADJUSTMENTS	A set of procedures that tell how to perform the 8520A Calibration Adjustments so that the instrument operates within the specifications listed in Section I.

1-4. LIST OF RECOMMENDED TEST EQUIPMENT

1-5. Table 1-1, lists the test equipment required to complete the Performance Tests and Calibration Procedures described in this manual. Equivalent instruments can be substituted if the recommended models are is not available.

1-6. SPECIFICATIONS

1-7. Table 1-2 lists the 8520A specifications.

Table 1-1. Test Equipment

ITEM	SPECIFICATIONS (MINIMUM)	NOMENCLATURE
DMM	5½ digits 0.005% dc accuracy	FLUKE 8800A
Oscilloscope	General Purpose	TEKTRONIX T900 Series
DC Voltage Standard	0.001% Accuracy	FLUKE 332D or 335D
Ratio Standard	0.1 ppm Resolution, 1 ppm Terminal Linearity	FLUKE 720A
AC Calibrator	≥0.03% Accuracy @ 20 kHz	FLUKE 5200A
Power Amplifier	≥0.044% Accuracy @ 20 kHz	FLUKE 5205A or 5215A
Standard Resistor w/Accessories		ESI 1010 100Ω and 10 kΩ, ESI 1050 1MΩ. ESI SB103 shorting bars, ESI PC101 Parallel Compensation Network
Load	1 MΩ/1 μF	1 MΩ ±1% 1/8 W, mF resistor in parallel with a 1 μF ±20% 10V capacitor

Table 1-2. 8520A Specifications

DC VOLTS

INPUT CHARACTERISTICS:

RANGE	FULL-SCALE	RESOLUTION	INPUT RESISTANCE
100 mV	199.999	1 μV	≥10,000 MΩ
1V	1.99999	10 μV	≥10,000 MΩ
10V	16.0100	100 μV	≥10,000 MΩ
100V	130.100	1 mV	10 MΩ
1000V	1024.00	10 mV	10 MΩ

ACCURACY ±(% of input + number of digits)

RANGE	24 HOURS 23°C ±1°C	90 DAYS 18°C to 28°C	1 YEAR 18°C to 28°C	PLUS TEMP. COEFFICIENT PER °C*
100 mV	0.003 + 5	0.0065 + 6	0.011 + 10	0.0005 + 0.5
1V	0.003 + 1	0.006 + 2	0.011 + 2	0.0005 + 0.15
10V	0.002 + 1	0.005 + 1	0.009 + 1	0.0004 + 0.10
100V	0.003 + 1	0.007 + 2	0.012 + 2	0.0005 + 0.15
1000V	0.0035 + 1	0.0065 + 1	0.011 + 1	0.0005 + 0.10

**From 22°C to 0°C or 24°C to 50°C, 24 hours specification*
From 18°C to 0°C or 28°C to 50°C, 90 day or 1 year specification

Table 1-2. 8520A Specifications (cont)

HIGH SPEED ACCURACY: ±(% of input + least significant bit)*

RANGE	90 DAYS 18°C to 28°C	1 YEAR 18°C to 28°C	PLUS TEMP. COEFFICIENT PER °C
100 mV	0.01 + 1	0.015 + 1	0.001 + .1
1V	0.01 + 1	0.015 + 1	0.001 + .05
10V	0.01 + 1	0.015 + 1	0.001 + .05
100V	0.01 + 1	0.015 + 1	0.001 + .05
1000V	0.01 + 1	0.015 + 1	0.001 + .05

**Typical with 60 Hz line, remote operation, 500 readings per second, 2-byte binary output with 14 bits of data.*

TYPICAL NORMAL MODE REJECTION:

LINE FREQ.	FILTER SETTLING TIME					
	25 ms	50 ms	100 ms	200 ms	500 ms	1s
50 Hz	65 dB	68 dB	71 dB	80 dB	*83 dB	86 dB
60 Hz	65 dB	68 dB	71 dB	85 dB	*88 dB	91 dB
400Hz	53 dB	56 dB	60 dB	120 dB	*123 dB	126 dB

**Guaranteed minimum rejection*

COMMON MODE REJECTION: True 100 dB at 50 Hz and 60 Hz with 1 kΩ unbalance in either lead. Effective CMR is equal to normal mode rejection plus true CMR.

MAXIMUM INPUT: ±1000V Peak, HI to LO or GUARD to chassis terminals, and ± 200V Peak, GUARD to LO terminals, for any range.

MAXIMUM READING RATE:

OPERATION	RESOLUTION	LINE	READING RATE
Local/Remote	5-1/2 digits	50 Hz 60 Hz	200 rdgs/sec 240 rdgs/sec
Remote	4-1/2 digits	50 Hz 60 Hz	>500 rdgs/sec >500 rdgs/sec

Input Current ≤50pA for 30 days @ 18°to 20°C

AC VOLTS (TRUE RMS)

INPUT CHARACTERISTICS

RANGE	FULL–SCALE	RESOLUTION	INPUT IMPEDANCE
1V 10V 100V 650V	1.99999 16.0100 130.100 650.00	10 μV 100 μV 1 mV 10 mV	1MΩ,≤100pF at the V/Ω INPUT terminal

Table 1-2. 8520A Specifications (cont)

ACCURACY: ±(% of input + % of full-scale)
For 650V range multiply % FS error shown by 1.6

FREQUENCY	24 HOURS 23°C±1°C			90 DAYS 23°C to 28°C			1 YEAR 18°C to 28°C		
	% of INPUT	+ % FS AC	+ % FS AC+DC	% of INPUT	+ % FS AC	+ % FS AC+DC	% of INPUT	+ % FS AC	+ % FS AC+DC
10 Hz to 20 Hz*	3.0	0.5	0.6	3.0	0.6	0.7	3.5	0.6	0.7
20 Hz to 40 Hz*	0.4	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.7
40 Hz to 20 kHz	0.08	0.02	0.06	0.1	0.03	0.08	0.15	0.05	0.16
20 kHz to 100 kHz	1.0	0.3	0.4	1.0	0.3	0.4	2.0	0.6	0.8
100 kHz to 300 kHz	2.4	0.6	0.6	2.4	0.6	0.6	4.0	1.0	1.0
300 kHz to 1 MHz	8.0	2.5	2.5	8.0	2.5	2.5	15.0	5.0	5.0

*Assumes smoothing using the Statistics Math Program (#8).

TEMPERATURE COEFFICIENT: 18°C to 0°C or 28°C to 50°C, to 20 kHz.
AC MODE: ±(.007% of input + .007% FS)/°C
AC + DC MODE: ±(.007% of input +.014% FS)/°C

MAXIMUM INPUT: ±1000V, Peak HI to LO or GUARD to chassis terminals, and ±200V Peak GUARD to LO terminals for any range.

CREST FACTOR: Exceeds 4:1 @ full scale, increasing downscale.

MAXIMUM READING RATE: 10 rdgs/sec.

OHMS

INPUT CHARACTERISTICS:

RANGE	FULL-SCALE	RESOLUTION	CURRENT THRU UNKNOWN	OPEN CIRCUIT VOLTAGE
10Ω	19.9999	100 μΩ	10 mA	
100Ω	199.999	1 mΩ	10 mA	
1000Ω	1999.99	10 mΩ	1.0 mA	
10 kΩ	19.9999	100 mΩ	0.1 mA	<8V
100 kΩ	199.999	1Ω	14.5 μA (max)	
1 MΩ	1.99999	10Ω	1.5 μA (max)	
10 MΩ	19.999	1 kΩ	1.5 μA (max)	

ACCURACY: ±(% of input + number of digits)

RANGE	24 HOURS 23°C ±1°C	90 DAYS 18°C to 28°C	1 YEAR 18°C to 28°C	PLUS TEMP. COEFFICIENT PER °C*
10Ω	0.0045 + 6	0.0080 + 7	0.0140 + 12	0.0007 + 0.2
100Ω	0.0035 + 2	0.0070 + 2	0.0125 + 3	0.0007 + 0.2
1000Ω	0.0035 + 2	0.0070 + 2	0.0125 + 3	0.0007 + 0.2
10kΩ	0.0035 + 2	0.0070 + 2	0.0125 + 3	0.0007 + 0.2
100kΩ	0.0040 + 2	0.0090 + 2	0.0140 + 3	0.0012 + 0.2
1MΩ	0.0090 + 2	0.0160 + 2	0.0200 + 3	0.0020 + 0.2
10MΩ	0.0300 + 1	0.0440 + 1	0.0450 + 3	0.0030 + 0.2

**From 18°C to 0°C or 28°C to 50°C*

Table 1-2. 8520A Specifications (cont)

MAXIMUM INPUT: ±400V peak for any range.

MAXIMUM READING RATE: 10/SEC at 100KΩ and above.

OPERATION	RESOLUTION	LINE	READING RATE
Local/Remote	5-1/2 digits	50 Hz 60 Hz	200 rdgs/sec 240 rdgs/sec
Remote	4-1/2 digits	50 Hz 60 Hz	>500 rdgs/sec >500 rdgs/sec

CONDUCTANCE

RANGE: 100 nS

FULL-SCALE: 202.00 nS

RESOLUTION: 0.01 nS

ACCURACY: ±(% of input + number of digits)

24 HOURS 23°C±1°C	90 DAYS 18°C to 28°C	1 YEAR 18°C to 28°C	*PLUS TEMP. COEFFICIENT PER °C
0.04 + 5	0.05 + 5	0.06 + 5	0.004 + 1

**From 18°C to 0°C or 28°C to 50°C*

MAXIMUM INPUT: ±400V peak

MAXIMUM READING RATE: 10 rdgs/sec

EXTERNAL REFERENCE

OPERATING RANGE: ±0.5V dc to ±33V dc as long as external reference is within ±16.5V of input LO terminal.

INPUT IMPEDANCE: 10,000 MΩ between external reference HI or LO terminals and input LO terminals.

ACCURACY:

X-REF VOLTAGE	ACCURACY
16.5V to 33V 0.5V to 16.5V	±(A + B + 20 ppm) ±[A + B + (400 ppm ÷ |Vref|)]

NOTE: A = DC 10 volt range accuracy
B = Input voltage or resistance range accuracy

MAXIMUM INPUT: ±180V peak between external reference HI or LO and input LO; ±360V peak between external reference HI and LO.

Table 1-2. 8520A Specifications (cont)

TRANSFER ACCURACY:

The following accuracy specifications apply when:
——Filter settling time is 500 or 1000 ms.
——Measurements are made more than 2 hours after warm-up.
——Measurements are made within one range.
——Standard is checked at least every hour.
——Ambient temperature stability within ±1°C.

DC VOLTAGE:

RANGE	±(% of input + number of digits)
100 mV	0.0020 + 4
1V	0.0020 + 1
10V	0.0010 + 1
100V	0.0020 + 1
1000V	0.0020 + 1

AC VOLTAGE (all ranges):

FREQUENCY	±(% of input + % of full-scale)
10 Hz to 20 Hz	1.0 + 0.2
20 Hz to 40 Hz	0.1 + 0.1
40 Hz to 20 kHz	0.005 + 0.007
20 kHz to 100 kHz	0.100 + 0.030
100 kHz to 1 MHz	0.500 + 0.060

AC VOLTAGE, DC COUPLED: Same as AC Voltage except 40Hz - 20KHz, 0.005+0.010

RESISTANCE:

RANGE	±(% of input + number of digits)
10Ω	0.0030 + 5
100Ω	0.0020 + 2
1000Ω	0.0020 + 2
10 kΩ	0.0020 + 2
100 kΩ	0.0020 + 2
1 MΩ	0.0050 + 2
10 MΩ	0.0100 + 1

CONDUCTANCE: ±(0.02% of input + 0.02 nS)

GENERAL:

INTERFACE: IEEE-488-1978 is standard.

TEMPERATURE: 0°C to 50°C operating; −25°C to +75°C non-operating.

RELATIVE HUMIDITY: ≤95% at 25°C, ≤75% at 40°C, ≤45% at 50°C.

SHOCK AND VIBRATION: Meets MIL-T-28800B for type III, Class 5, Style E.

Table 1-2. 8520A Specifications (cont)

POWER: 100, 120, 220, or 240V ac, ±10%; 50, 60, or 400 Hz ±5%, ⩽50W.

SIZE: 8.89 cm H/47.00 cm L/43.18 cm W––(3 1/2 in H/18 1/2 in L/17 in W) See Figure 1-2.

WEIGHT: 9.56 kg (21 lbs)

PROTECTION CLASS CODE 1: (Relates solely to insulation or grounding properties in IEC 348).

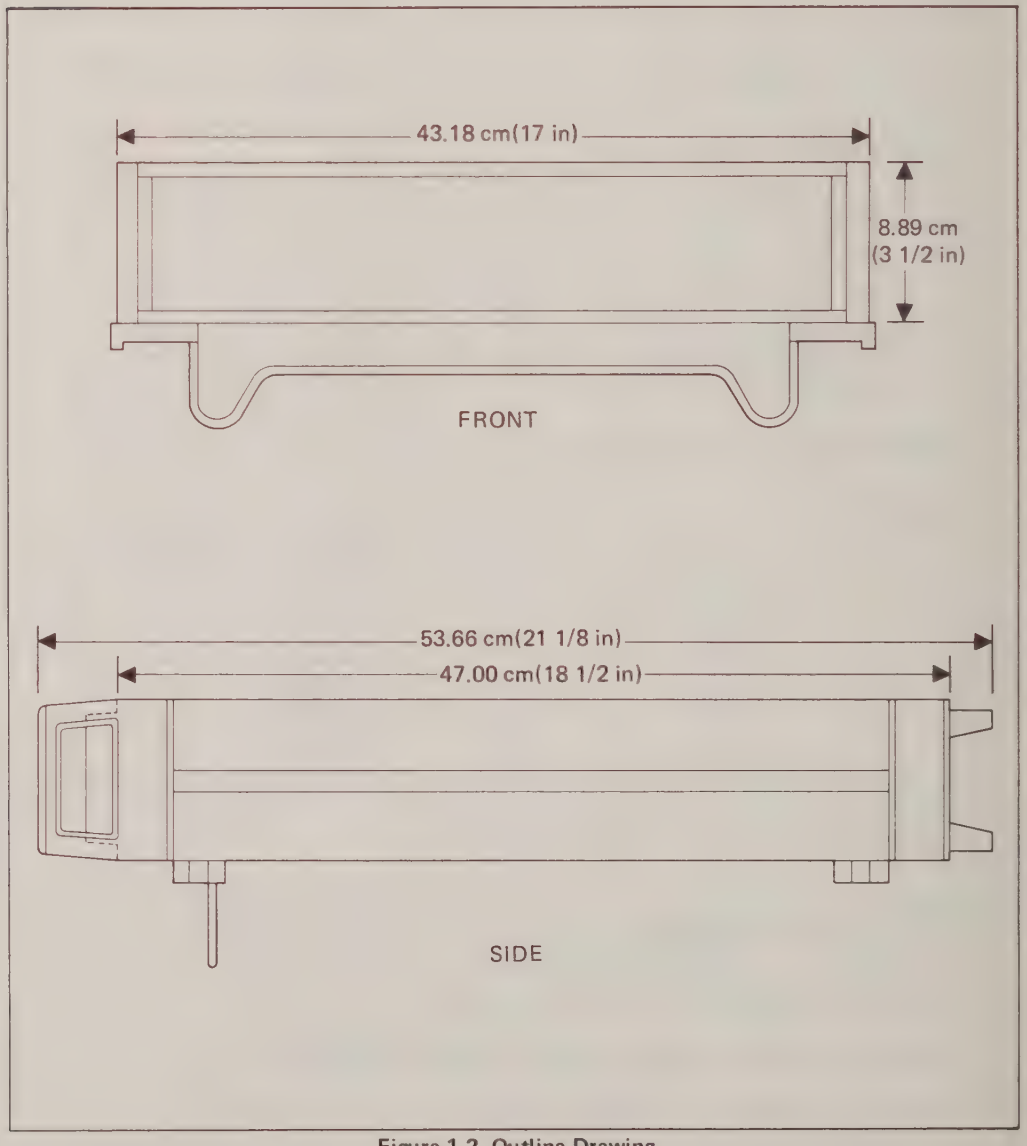


Figure 1-2. Outline Drawing

Section 2
Shipping and Service Information

2-1. SHIPPING INFORMATION

2-2. The 8520A is packaged and shipped in a foam-packed container. When you receive the 8520A, inspect the instrument thoroughly for possible shipping damage. Special instructions for inspection and claims are included on the shipping container.

2-3. If reshipment is necessary, use the original container. If the original container is not available, order a new container from John Fluke Mfg. Co., Inc./P.O. Box 43210/Mountlake Terrace, Washington 98043 telephone (206) 774-2211.

2-4. SERVICE INFORMATION

2-5. Each John Fluke Model 8520A Digital Multimeter is warranted for a period of one year upon delivery to the original purchaser. The WARRANTY is located at the front of this manual.

2-6. Factory authorized calibration and service for each Fluke product is available at various worldwide locations. Table 2-1 and 2-2 provide a complete list of these service centers. If requested, the customer will be provided with an estimate before any work begins on instruments that are beyond the Warranty period.

2-7. QUESTIONS

2-8. For additional information, contact your nearest John Fluke Sales Representative (Table 2-3 and 2-4) or the John Fluke Mfg. Co., Inc. at the address or telephone number given above.

Table 2-1. Fluke Technical Service Centers - U.S. and Canada

UNITED STATES

CA, Burbank
Fluke Technical Center
2020 N. Lincoln Street
Burbank, CA 91504
(213) 849-4641

CA, Santa Clara
Fluke Technical Center
2300 Walsh Avenue
Santa Clara, CA 95050
(408) 985-1200

CO, Denver
Fluke Technical Center
1980 S. Quebec Street, Unit 4
Denver, CO 80231
(303) 750-1228

FL, Orlando
Fluke Technical Center
940 N. Fern Creek Avenue
Orlando, FL 32803
(305) 896-2296

IL, Rolling Meadows
Fluke Technical Center
1400 Hicks Road
Rolling Meadows, IL 60008
(312) 398-5800

MA, Waltham
Fluke Technical Center
244 Second Avenue
Waltham, MA 02154
(617) 890-1604

MD, Rockville
Fluke Technical Center
5640 Fishers Lane
Rockville, MD 20852
(301) 770-1576

MN, Apple Valley
Fluke Technical Center
7373 West 147th Street, Suite 196
Apple Valley, MN 55124
(612) 432-9400

NC, Greensboro
Fluke Technical Center
1310 Beaman Place
Greensboro, NC 27408
(919) 273-1918

NJ, Paramus
Fluke Technical Center
West 75th Century Road
Paramus, NJ 07652
(210) 262-9550

TX, Dallas
Fluke Technical Center
14400 Midway Road
Dallas, TX 75240
(214) 233-9945

WA, Mountlake Terrace
John Fluke Mfg. Co., Inc.
21707 66th Avenue W., Suite 1
Mountlake Terrace, WA 98043
(206) 774-2206

CANADA

ALB, Calgary
Allan Crawford Assoc., Ltd.
1935 30th Avenue N.E. #14
Calgary, ALB T2E 6Z5
(403) 230-1341

ONT, Mississauga
Allan Crawford Assoc., Ltd.
6503 Northam Drive
Mississauga, ONT L4V 1J5
(416) 678-1500

QUE, St. Laurent
Allan Crawford Assoc., Ltd.
7018 Cote de Liesse
St. Laurent, QUE H4T 1E7
(514) 731-8564

Table 2-2. Fluke Technical Service Centers - International

ARGENTINA
Fluke Latin American
Service Headquarters
Virrey del Pino 4071
Buenos Aries, Argentina
Tel: 523185

AUSTRALIA
Elmeasco Instrument Pty Ltd.
P.O. Box 30
Concord, N.S.W.
Australia 2137
Tel: (02) 736-2888

AUSTRIA
Walter Rekirsch
Elektronische Gerate GmbH & Co.
Vertriebs-KG.
Liechtensteinstrasse 97/6
A-1090 Vienna, Austria
Tel: 09-43-222-347646

BELGIUM
Fluke (Belgium)S.A./N.V.
6, Rue de Geneve
1140 Brussels, Belgium
Tel: 09-32-2-2164090

BRAZIL
Arotec S.A.
Industria e Comercio
Av. Pacaembu 811
01234 Sao Paulo S.P., Brazil
Tel: 826-2266

CHILE
Intronica Chile Ltda.
Casilla 16228
Santiago 9, Chile
Tel: 44940

COLOMBIA
Coasin Ltda.
Carrera 13, # 37-37, Of. 407
Ap. Aero 29583
Bogota DE, Colombia
Tel: 285-0230

DENMARK
Tage Olsen A/S
Ballerup Byvej 222
DK-2750 Ballerup
Denmark
Tel: (01) 2-65 81 11

ECUADOR
Proteco Coasin Cia., Ltda.
Edificia "Jerico"
Ave. 12 de Octubre #2285y
Ave. Orellana (Planta Baja)
Quito, Ecuador
Tel: 526759

EGYPT
Lotus Engineering Organisation
P.O. Box 1252
Cairo, Egypt
Tel: 71617

FINLAND
Oy Findip AB
Teollisuustie 7
02700 Kauniainen
Finland
Tel: 09-358-0-502255

FRANCE
M.B. Electronique S.A.
Rue Fourny
ZAC de BUC
B.P. #31
78530 BUC, France
Tel: 09-33-1-9568131

GREECE
Hellenic Scientific
Representations Ltd.
11, Vrassida Street
Athens 615, Greece
Tel: 09-30-1-711140

HONG KONG
Gilman Industrial Bldg., 9F
107-109 Wai Yip Street
Kwun Tong
Kowloon, Hong Kong
Tel: 3-427144

Table 2-2. Fluke Technical Service Centers - International (cont)

INDIA
Hinditron Services Pvt. Ltd.
"Hinditron House"
412 Raj Mahal Vilas Extension
Bangalore 560 006, India
Tel: 33139

Hinditron Services Pvt. Ltd.
69 A.L. Jagmohandas Marg
Bombay 400 006, India
Tel: 365344

INDONESIA
P.T. Dwi Tunggal Jaya Sakti
Sangga Buana Bldg., 1st Floor
J1. Senen Raya 44, P.O. Box 4435
Jakarta, Indonesia
Tel: 376608

IRAN
Irantronics Company Ltd.
20 Salm Road
Roosevelt Avenue
Tehran, Iran
Tel: 828294/831564

ISRAEL
R.D.T. Electronics Engineering Ltd.
P.O. Box 75
46, Sokolov Street
Ramat Hasharon 47235
Israel
Tel: 09-972-3-483211

ITALY
Sistrel S.p.A.
Via Timavo 66
20099 Sesto S. Giovanni (Milan)
Italy
Tel: 09-39-2-2476693

Sistrel S.P.A.
Via Guiseppe Armellini #37
00143 Rome, Italy
Tel: 09-39-6-5915551

JAPAN
John Fluke Mfg. Co., Inc.
Japan Branch
1 Higashikata-machi
Midori-ku
Yokohama 226, Japan
Tel: (045) 473-5425

KOREA
Electro-Science Korea Co.
C.P.O. Box 8446
Room 1201 Bowon Bldg.
490 Chongro - 5 Ka
Chongro-ku
Seoul, Korea
Tel: 261-7702

MALASIA
O'Connor's (Malaysia) SDN. BHD.
P.O. Box 91
Petaling Jaya, Selangor
West Malaysia
Tel: 51563

MEXICO
C.J. Christensen S.A. De C.V.
Melchor Ocampo 150-8
Mexico 4 D.F., Mexico
Tel: (905) 535-2258

NETHERLANDS
Fluke (Nederland) B.V.
P.O. Box 5053
5004 EB Tilburg
The Netherlands
Tel: (013) 673973

NEW ZEALAND
W & K McLean Ltd.
P.O. Box 18065
Glen Innes
Auchland, New Zealand
Tel: 587-037

NORWAY
Morgenstierne & Co. A/A
Konghellegate 3
P.O. Box 6688, Rodelokka
Oslo 5, Norway
Tel: 09-47-2-356110

PAKISTAN
Pak International Operations
505 Mohammadi House
1.1. Chundrigar Road
Katrachi-2 Pakistan
Tel: 221127/239052

PERU
Importaciones Y Representaciones
Electronicas S.A.
Avda. Franklin D. Roosevelt 105
Lima 1, Peru
Tel: 288650

PORTUGAL
Equipamentos de Laboratorio, Ltda
P.O. Box 1100
Lisbon 1002, Portugal
Tel: 09-351-1-578936/547512

REPUBLIC OF SINGAPORE
Rank O'Connor's (PTE) Ltd.
98 Pasir Panjang Road
Singapore 0511
Republic of Singapore
Tel: 637944

REPUBLIC OF SOUTH AFRICA
Fluke S.A. (Pty) Ltd.
P.O. Box 39797
Bramley 2018
Republic of South Africa
Tel: (011) 786-3170

SPAIN
Hispano Electronica S.A.
Apartado de Correos 48
Alcorcon (Madrid)
Spain
Tel: 09-3416194108

SWEDEN
Teleinstrument AB
P.O. Box 490
S-162 Vallingby 4
Sweden
Tel: 09-46-8-380370

SWITZERLAND
Traco Electronic AG
Jenatschstrasse 1
8002 Zurich
Switzerland
Tel: 09-41-1-2010711

TAIWAN
CCT Associates, Inc.
P.O. Box 24209
Taipei, Taiwan
Republic of China
Tel: (02) 391-6894/393-5760

THAILAND
Dynamic Supply Engineering R.O.P.
56 Ekamai, Sukhumvit 63
Bangkok-11, Thailand
Tel: 914434/928532

TURKEY
Erkman Electronik Aletler
Ticaret Anonim Sirketi
Necatiby Cad 92/3
Karakoy, Istanbul, Turkey
Tel: 09-44-1-5461

UNITED KINGDOM
Fluke International Corp. - UK
Colonial Way
Watford, Herts. WD24TT
United Kingdom
Tel: 09-4492340511

URUGUAY
Coasin Uruguaya S.R.L.
Edifico Ciudadela
Sarandi 690 D. Esc. 109
Casilla de Correos 1400
Correo Central
Montevideo, Uruguay
Tel: 917978

VENEZUELA
Coasin C.A.
Apdo. Postal 50939
Sabana Grande # 1
Caracas 105, Venezuela
Tel: 782-9109

WEST GERMANY
Fluke (Deutschland) GmbH
Krausstrasse 32
8045 Ismaning
West Germany
Tel: (089) 96251

Customers in the following countries: Bulgaria, Czechoslovakia, Hungary, Poland, Romania, U.S.S.R., and Yugoslavia, contact: Amtest Associates Ltd., P.O. Box 55, Addlestone, Surrey, KT 15 1DU, England, Tel. (0932) 52121

Table 2-3. Sales Representatives - U.S. and Canada

UNITED STATES

AK, Anchorage
Harry Lang & Associates
1371 Hillcrest Drive #303
Anchorage, AK 99503
(907) 279-5741

AL, Huntsville
John Fluke Mfg. Co., Inc.
3322 Memorial Parkway
Huntsville, AL 35807
(205) 881-6220
(404) 321-0980 (Atlanta)

AZ, Tempe
John Fluke Mfg. Co., Inc.
2125 S. 48th Street, Suite 104
Tempe, AZ 85285
(602) 967-8724

CA, Los Angeles
John Fluke Mfg. Co., Inc.
20902 S. Bonita Street
Carson, CA 90746
(213) 538-3900

CA, Santa Clara
John Fluke Mfg. Co., Inc.
2300 Walsh Avenue
Santa Clara, CA 95050
(408) 244-1505

CA, Tustin
John Fluke Mfg. Co., Inc.
15445 Red Hill Avenue, Suite F
Tustin, CA 92680
(714) 838-8863
(714) 226-1254 (San Diego)

CO, Denver
John Fluke Mfg. Co., Inc.
1980 S. Quebec, #4
Denver, CO 80231
(303) 750-1222

CT, Hartford
John Fluke Mfg. Co., Inc.
124 Hebron Avenue
Glastonbury, CT 06033
(203) 633-0777

FL, Orlando
John Fluke Mfg. Co., Inc.
940 N. Fern Creek Avenue
Orlando, FL 32803
(305) 896-4881

HI, Honolulu
EMC Corporation
2979 Ualena Street
Honolulu, HI 96819
(808) 847-1138

IA, Iowa City
John Fluke Mfg. Co., Inc.
1027 Hollywood Blvd., Suite 309
Iowa City, IA 52240
(319) 354-2811

IL, Chicago
John Fluke Mfg. Co., Inc.
4300 Lincoln, Unit K
Rolling Meadows, IL 60008
(312) 398-0850

IN, Indianapolis
John Fluke Mfg. Co., Inc.
5610 Crawfordsville Road,
Suite 802
Indianapolis, IN 46224
(317) 244-2456

LA, Metairie
John Fluke Mfg. Co., Inc.
2700 Kingman Street, Suite 103
Metairie, LA 70002
(504) 455-0814

MA, Waltham
John Fluke Mfg. Co., Inc.
244 Second Avenue
Waltham, MA 02154
(617) 890-1600

MD, Baltimore
John Fluke Mfg. Co., Inc.
5640 Fishers Lane
Rockville, MD 20852
(301) 770-1570
(301) 792-7060 (Baltimore)

MI, Detroit
John Fluke Mfg. Co., Inc.
13955 Farmington Road
Livonia, MI 48154
(313) 522-9140

MN, Minneapolis
John Fluke Mfg. Co., Inc.
7373 W. 147th Street, Suite 196
Apple Valley, MN 55124
(612) 432-9400

MO, Kansas City
John Fluke Mfg. Co., Inc.
4406 Chouteau Traffic Way
Kansas City, MO 64117
(816) 454-5836

MO, St. Louis
John Fluke Mfg. Co., Inc.
300 Brookes Drive, Suite 100
Hazelwood, MO 63042
(314) 731-3388

NC, Greensboro
John Fluke Mfg. Co., Inc.
1310 Beaman Place
Greensboro, NC 27408
(919) 273-1918

NJ, Paramus
John Fluke Mfg. Co., Inc.
West 75 Century Road
Paramus, NJ 07625
(201) 262-9550

NM, Albuquerque
John Fluke Mfg. Co., Inc.
1108 Alvarado Drive N.E.
Albuquerque, NM 87110
(505) 265-8431

NY, Rochester
John Fluke Mfg. Co., Inc.
4515 Culver Road
Rochester, NY 14622
(716) 266-1400

OH, Cleveland
John Fluke Mfg. Co., Inc.
7830 Freeway Circle
Middleburg Heights, OH 44130
(216) 234-4540

OH, Dayton
John Fluke Mfg. Co., Inc.
4756 Fishburg Road
Dayton, OH 45424
(513) 233-2238

OR, Portland
John Fluke Mfg. Co., Inc.
18360 S.W. Springfield Lane
Aloha, OR 97006
(502) 642-1342

PA, Philadelphia
John Fluke Mfg. Co., Inc.
1010 W. 8th Avenue, Suite H
King of Prussia, PA 19406
(215) 265-4040
(412) 261-5171 (Pittsburgh)

TX, Austin
John Fluke Mfg. Co., Inc.
111 W. Anderson Lane, Suite 213
Austin, TX 78752
(512) 478-9901

TX, Dallas
John Fluke Mfg. Co., Inc.
14400 Midway Road
Dallas, TX 75243
(214) 233-9990

TX, Houston
John Fluke Mfg. Co., Inc.
1014 Wirt Road, Suite 270
Houston, TX 77055
(713) 683-7913
(512) 222-2726 (San Antonio)

UT, Salt Lake City
John Fluke Mfg. Co., Inc.
782 E. 8325 South
Sandy, UT 84070
(801) 566-4864

WA, Kennewick
John Fluke Mfg. Co., Inc.
3613 W. 16th Place #C
Kennewick, WA 99336

WA, Seattle
John Fluke Mfg. Co., Inc.
975 Industry Drive
Seattle, WA 98188
(206) 575-3765

For more information on Fluke products or Sales Offices you may dial (800) 426-0361 toll free in most of U.S. From Alaska, Hawaii, Washington, or Canada phone (206) 774-2481. From other countries phone (206) 774-2398.

Table 2-3. Sales Representatives - U.S. and Canada (cont)

CANADA

ALB, Calgary
Allan Crawford Assoc., Ltd.
1935 30th Avenue N.E., #14
Calgary, ALB T2E 6Z5
Tel: (403) 230-1341

BC, North Vancouver
Allan Crawford Assoc., Ltd
3795 William Street
Burnaby, BC Y5C 3H3
Tel: (604) 294-1326

NS, Halifax
Allan Crawford Assoc., Ltd
Townsend Place, Suite 201
800 Windmill Road
Burnside Industrial Park
Dartmounth, NS B3B 1L1
Tel: (902) 469-7865

ONT, Ottawa
Allan Crawford Assoc., Ltd
1299 Richmond Road
Ottawa, ONT K2B 7Y4
Tel: (613) 829-9651

ONT, Toronto
Allan Crawford Assoc., Ltd.
6503 Northam Drive
Mississauga, ONT L4V 1J5
Tel: (416) 678-1500

QUE, Montreal
Allan Crawford Assoc., Ltd.
7018 Cote de Liesse
St. Laurent, QUE H4T 1E7
Tel: (514) 731-8564

For Canadian areas not listed, contact the office nearest you or Allan Crawford Assoc. Ltd., Mississauga (Toronto), Ontario.

Table 2-4. Sales Representatives - International

Supplied and Supported by Fluke International Corporation, P.O. Box 43210, Mountlake Terrance, WA 98043, Tel: (206) 774-2398, TLX: 152662 JOHNFLUKE MTLT

ARGENTINA
Coasin S.A.
Virrey del Pino 4071
Buenos Aires, Argentina
Tel: 525130
TLX: 390122284 COASN AR

AUSTRALIA
Elmeasco Instruments Pty Ltd.
P.O. Box 30
Concord, N.S.W.
Australia 2137
Tel: (2) 736-2888
TLX: 79025887

Elmeasco Instruments Pty Ltd.
P.O. Box 107
Mt. Waverly, VIC. 3149
Australia
Tel: 233-4044
TLX: 26206 (ELMVIC)

Elmeasco Instruments Pty Ltd.
Professional Suite's Bldg.
B.P.O. Box 2360
Brisbane, 4001
Australia
Tel: (07) 229-3161

Elmeasco Instruments Pty Ltd.
P O. Box 1240
G.P.O. Adelaide 5001
South Australia

BOLIVIA
Coasin Bolivia S.R.L.
Casilla 7295
La Paz, Bolivia
Tel: 40962
TLX: Public Booth # 5377, indicate "Para Coasin B.S.R.L.; Av 6 de Agosto 2300 3er Piso, La Paz tl 40962"

BRAZIL
Arotec S.A.
Industria e Comercio
Av. Pacaembu 811
01234 Sao Paulo S.P., Brazil
Tel: (011) 67-2393
TLX: 1122207 AROT BR

Arotec S.A.
Rua Araguari, 1705 s 402
30.000 Belo Horizonte M.G., Brazil

Arotec S.A.
Av. Rio Branco 277
Grupo 1309
02000 Rio de Janeiro, R.J., Brazil
Tel: (021) 242-9776

BRUNEI
O'Connor's Limited
(Brunei Branch) Chin Kian Bldg.
P.O. Box 2126
Bandar Seri Begawan, Brunei
Tel: 26680

CHILE
Intronica Chile Ltda.
Manuel Montt 024 - Of. D
Casilla 16228
Santiago 9, Chile
Tel: 44940
TLX: 40301 Cab Publ.,
Attn: Intronica Chile

CHINA, PEOPLE'S REPUBLIC OF
China National Instrument Import & Export Corp.
P.O. Box 49, Erh-Li-Kou
Hsi Chi'ao
Beijing
People's Republic of China
TLX: CO 2242 CNIEC

COLOMBIA
Coasin Ltda.
Carrera 13, # 37-37, Of. 407
Ap. Aero 29583
Bogota DE, Colombia
Tel: 285-0230/0250
TLX: 45787 COASN CO

ECUADOR
Proteco Coasin Cia., Ltda.
Edificio "Jerico"
Ave. 12 de Octubre #2285 y
Ave. Oreliana (Planta Baja)
Quito, Ecuador
Tel: 529684
TLX: 2865 Protec Ed

Proteco Coasin Cia., Ltda
Casilla 9733
9 de Octubre 424
Edificio Gran Pasaje, Of. 1012
Guayaquil, Ecuador

HONG KONG
Gilman & Co., Ltd.
P.O. Box 56
Gilman Ind. Bldg. 9 F
107-109 Wai Yip Street
Kwun Tong, Kowloon
Hong Kong
Tel: 5-7909633
TLX: 73358 GILMN HX

ICELAND
Kristjan O. Skagfjord Ltd.
P.O. Box 906
Reykjavik, Iceland
Tel: 24120
TLX: 2133 KOS-1S

INDIA
Hinditron Services Pvt. Ltd.
69 A.L., Jagmohandas Marg
Bombay 400 006
India
Tel: 811316
TLX: 953-112326 Hspl In

Table 2-4. Sales Representatives - International (cont)

Hinditron Services Pvt. Ltd.
"Hinditron House"
412 Raj Mahl Vilas Extension
Bangalore 560 006
India
Tel: 33139
TLX: 043741

INDONESIA
P.T. Dwi Tunggal Jaya Sakti
Sangga Buana Bldg., 1st Floor
Jl. Senen Raya 44, P.O. Box 4435
Jakarta, Indonesia
Tel: 367390-9
TLX: 46624 SABUANA 1A

P.T. Dwi Tunggal Jaya Sakti
Jalan Sasakgantung 45
Bandung, Indonesia
Tel: 367390-9
TLX: 46624 SABUANA 1A

JAPAN
John Fluke Mfg. Co., Inc.
Japan Branch
(PC Board Testers only)
1 Higashikata-machi
Midori-ku
Yokohama 226, Japan
Tel: (045) 473-5425
TLX: 3823-666 FLUKJPJ

Tokyo Electron Ltd.
38 Fl. Shinjuko Nomura Bldg.
1-26-2, Nishi-Shinjuku
Shinjuku-ku
Tokoyo 160, Japan
Tel: 03-343-4411
TLX: 2322220 LABTEL J

KENYA
Advanced Communications Ltd.
P.O. Box 30070
Nairobi, Kenya
East Africa
Tel: 331955
TLX: 22639 ADCOM

KOREA
Electro-Science Korea Co.
C.P.O. Box 8446
Room. 1201 Bowon Bldg.
490 Chongro - 5 Ka
Chongro-ku
Seoul, Korea
Tel: 261-7702
TLX: 78723270+

MALAYSIA
O'Connor's (PTE) Limited
P.O. Box 91
Petaling Jaya, Selangor
West Malaysia
Tel: 51563
TLX: OCONOR MA37649

O'Connor's (PTE) Limited
Lot # 5 Taman Mesra
Mile 3, Jalan Penampang
Kota Kinabulu
East Malaysia
Tel: 55322
TLX: MA80286FL

MEXICO
C.J. Christensen S.A. De C.V.
Instrumentos Electronicos
de Medicion
Melchor Ocampo 150-8
Mexico 4 D.F., Mexico
Tel: (905) 535-2258

NEW ZEALAND
W & K McLean Ltd.
P.O. Box 18065
Glen Innes
Auckland, New Zealand
Tel: 587-037
TLX: N.Z. 7912763

W & K McLean Ltd.
P.O. Box 2421
Christchurch, New Zealand

W & K McLean Ltd.
P.O. Box 496
Wellington, New Zealand
Tel: 851-450

NIGERIA
Mofat Engineering Co., Ltd.
P.O. Box 6369
Lagos, Nigeria
TLX: 21353, Attn: MOFAT

PAKISTAN
Pak International Operations
505 Muhammadi House
- McLeod Road
P.O. Box 5323
Karachi, Pakistan
Tel: 221127
TLX: 24494 PIO PK

PERU
Importaciones Y Representaciones
Electronicas S.A.
Avda. Franklin D. Roosevelt 105
Lima 1, Peru
Tel: 288650
TLX: 37425663

SINGAPORE
Rank O'Connor's (PTE) Limited
98 Pasir Panjang Road
Singapore 0511
Republic of Singapore
Tel: 637944
TLX: OCONSIN RS21023

SOUTH AFRICA
Fluke S.A. (Pty) Ltd.
P.O. Box 39797
Bramley 2018
Republic of South Africa
Tel: (011) 786-3170
TLX: 82899

TAIWAN
CCT Associates, Inc.
P.O. Box 24209
Taipei, Taiwan
Republic of China
Tel: (02) 391-6894
TLX: 24263 Longgulf

THAILAND
Dynamic Supply Engineering R.O.P.
56 Ekamai, Sukhumvit 63
Bangkok-11, Thailand
Tel: 914434
TLX: TH 82938 MONTIEN TH

URUGUAY
Coasin Uruguaya S.R.L.
Edif. Ciudadela
Sarandi 690 D. Esc. 109
Casilla de Correos 1400
Correo Central
Montevideo, Uruguay
Tel: 917978
TLX: Public Booth UY901 Coasin

VENEZUELA
Coasin C.A.
Apdo. Postal 50939
Sabana Grande # 1
Caracas 105, Venezuela
Tel: 782-9109-8741
TLX: 39531228

Latin America also Supported by -

Sr. Leonardo Cusnir, c/o COASIN A.A., Virrey del Pino 4071, Buenos Aires, Argentina, Tel: 523185, TLX: 390122284 COASN AR

Sr. Benewaldo Padovani, c/o AROTEC S.A., Industria e Comericio, Av. Pacaembu 811, 01234 Sao Paulo S.P., Brazil, Tel: (011) 67-2393, TLX: 1122207 AROT BR

Table 2-4. Sales Representatives - International (cont)

Supplied and Supported by Fluke (Holland) B.V., P.O. Box 5053, Zevenheuvelenweg 53, 5004 EB Tilburg, Netherlands, Tel: (013) 673973, TLX: 522337

AUSTRIA
Walter Rekirsch
Electronische Gerate GmbH & Co.
Vertriebs-KG
Liechtensteinstrasse 97/6
A-1090 Vienna, Austria
Tel: (222) 347646
TLX: 134759

BELGIUM
Fluke (Belguim) S.A./N.V.
6 Rue de Geneve
1140 Brussels, Belgium
Tel: (2) 2164090
TLX: 26312

BULGARIA
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (923) 52121
TLX: 928855

CHAD
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

CYPRUS
Chris Radiovision Ltd.
P.O. Box 1989
Nicosia, Cyprus
Tel: 66121
TLX: 2395

CZECHOSLOVAKIA
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

DENMARK
Tage Olsen A/S
Ballerup Byvej 222
DK - 2750 Ballerup, Denmark
Tel: (2) 658111
TLX: 35293

EGYPT AND SUDAN
Lotus Engineering Organisation
P.O. Box 1252
22, Kasi El Nil
Cairo, Egypt
Tel: 971617
TLX: 92504

EIRE (REPUBLIC OF IRELAND)
Euro Electronics
32 Brews Hill
Naven, County Meath
Tel: 46-23577
TLX: 31821

ETHIOPIA
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

FINLAND
Oy Findip AB
Teollisuustie 7
02700 Kauniainen, Finland
Tel: (0) 502255
TLX: 123129

FRANCE
M.B. Elctronique S.A.
Rue Fourny
ZAC de BUC
B.P. # 31
78530 BUC, France
Tel: (1) 9568131
TLX: 695414

GERMAN DEMOCRATIC REPUBLIC
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

GERMAN FEDERAL REPUBLIC
Fluke (Deutschland) GmbH
Krausstrasse 55
8045 Ismaning
West Germany
Tel: (089) 96251
TLX: 0522472
Rapitax: (089) 966718

Fluke (Deutschland) GmbH
Meineckestrasse 53
4000 Dusseldorf 30
West Germany
Tel: (0211)450831
TLX: 8585576

Fluke (Deutschland) GmbH
Oberer Kirchhaldenweg 135
7000 Stuttgart 1
West Germany
Tel: (0711) 694091
TLX: 722518

PK Electronik
Lietzenburger Strasse 91
1000 Berlin 15
West Germany
Tel: (030) 8831058

GREECE
Hellenic Scientific
Representations Ltd.
11, Vrasside Street
Athens 615, Greece
Tel: (1) 711140
TLX: 219330

HUNGARY
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

IRAN
Irantronics Company Ltd.
20. Salm Road
Roosevelt Avenue
Tehran, Iran
Tel: 828294/831564
TLX: 212956/212876

IRAQ
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

IRELAND
Euro Electronics
32 Brews Hill
Naven County Meath
Ireland
Tel: (46) 23577
TLX: 3182

ISRAEL
R.D.T. Electronics Engineering Ltd.
P.O. Box 75
46, Sokolov Street
Ramat Hasharon 47235
Israel
Tel: (3) 483211
TLX: 32143

ITALY
Sistrel S.p.A.
Via Giuseppe Armellini # 37
00143 Rome, Italy
Tel: (6) 5915551
TLX: 680356

Sistrel S.p.A.
Via Timavo 66
20099 Sesto S. Giovanni (Milan)
Italy
Tel: (2) 2476693
TLX: 320346

Sistrel S.p.A
Via Cintia
Parco S. Paolo 35
80126 Naples, Italy
Tel: (81) 7679700

KUWAIT
Tareq Company
P.O. Box Safat 20506
Kuwait, Arabian Gulf
Tel: 436100/436045
TLX: 2315

Table 2-4. Sales Representatives - International (cont)

LEBANON AND JORDAN
Mabek (Electronics Division)
P.O. Box 11-3823
Beirut, Lebanon
Tel: 252631/348728
TLX: 22889

LIBYA
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

MOROCCO
Mainvest
Residence Moulay Ismail
Bat. C.
Boulevard Moulay Slimane
Rabat, Morocco
Tel: (7) 27664
TLX: 31036

NETHERLANDS
Fluke (Nederland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

NORWAY
Morgenstierne & Co. A/A
Konghellegate 3
P.O. Box 6688, Rodelokka
Oslo 5, Norway
Tel: (2) 356110
TLX: 11719

PDR YEMEN
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

POLAND
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

PORTUGAL
Equipamentos de Laboratorio, Ltda.
P.O. Box 1100
1002 Lisbon, Portugal
Tel: (1) 578936/547512
TLX: 18469

QATER, OMAN &
UNITED ARAB EMIRATES
Technology Organisation
P.O. Box 5549
Doha, Qatar
Tel: 321431
TLX: 4581

ROMANIA
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

SAUDI ARABIA
Electronic Equipment
Marketing Co. Ltd.
P.O. Box 3750
Riyadh, Saudi Arabia
Tel: 32761/32700/37023
TLX: 201120

SOMALIA
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

SPAIN
Hispano Electronica S.A.
Piligono Industrial Urtinsa
Apartado de Correos 48
Alcorcon (Madrid)
Spain
Tel: (1) 6194108
TLX: 22404/42634

SWEDEN
Teleinstrument AB
P.O. Box 490
S-162 04 Vallingby 4
Sweden
Tel: (8) 380370
TLX: 11347

SWITZERLAND
Traco Electronic Company Ltd.
I. Jenatschstrasse
Postfach, 8027 Zurich
Switzerland
Tel: (1) 2010711
TXL: 54318

SYRIA
Mabek (Electronics Division)
P.O. Box 4238
Damascus, Syria

TURKEY
Erkman Electronik Aletler
Ticaret Anonim Sirketi
Necatiby Cad 92/3
Karakoy, Istanbul, Turkey
Tel: (1) 5461
TLX: 23353

UNITED KINGDOM
Fluke International Corp.-UK
Colonial Way
Watford, Herts, WD 24 TT
United Kingdom
Tel: (923) 40511

U.S.S.R.
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

YEMEN
Fluke (Holland) B.V.
P.O. Box 5053,
Zevenheuvelenweg 53
5004 EB Tilburg, Netherlands
Tel: (013) 673973
TLX: 52237

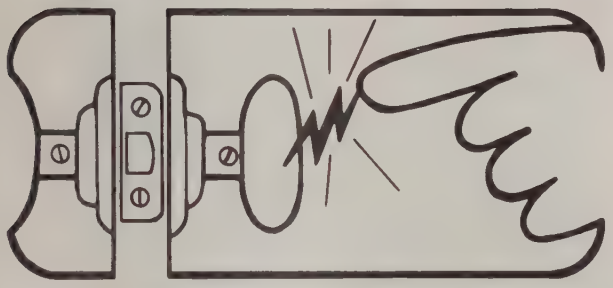
YUGOSLAVIA
Amtest Associates Ltd.
P.O. Box 55
Addlestone, Surrey KT15 1DU
United Kingdom
Tel: Weybridge (932) 52121
TLX: 928855

Customers in the following countries: Bulgaria, Czechoslovakia, Hungary, Poland, Romania, U.S.S.R., and Yugoslavia, contact: Amtest Associates Ltd., P.O. Box 55, Addlestone, Surrey, KT 15 1DU, England, Tel. (0932) 52121

static awareness

A Message From

John Fluke Mfg. Co., Inc.

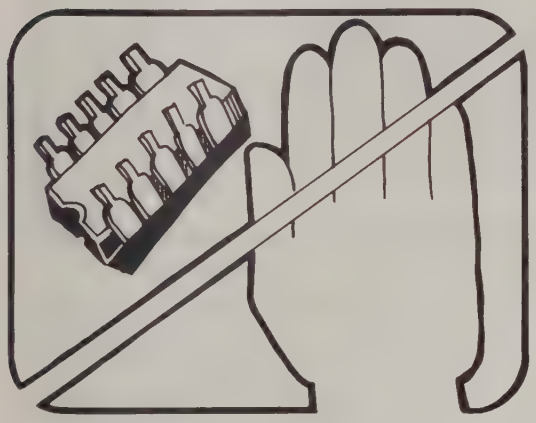


Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

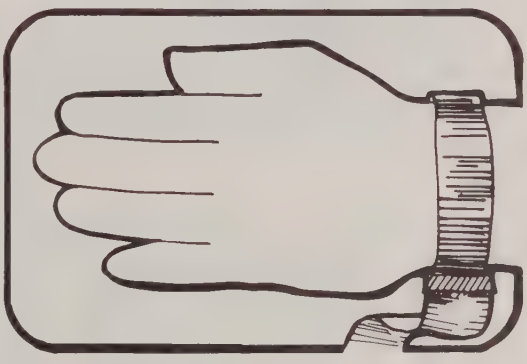
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol "⊗".

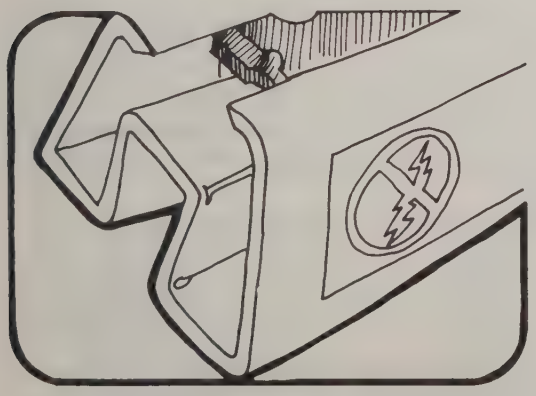
The following practices should be followed to minimize damage to S.S. devices.



1. MINIMIZE HANDLING

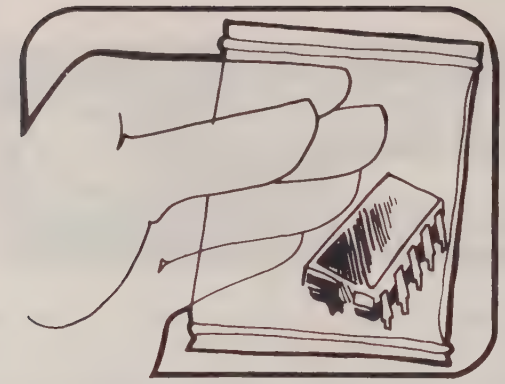


3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES

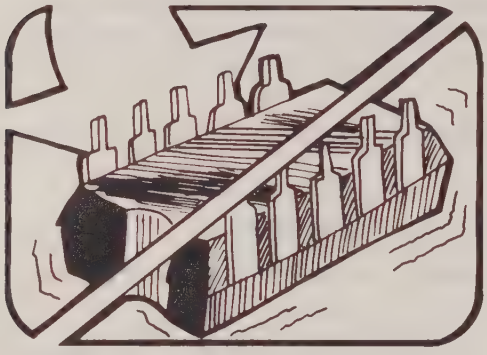


2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.

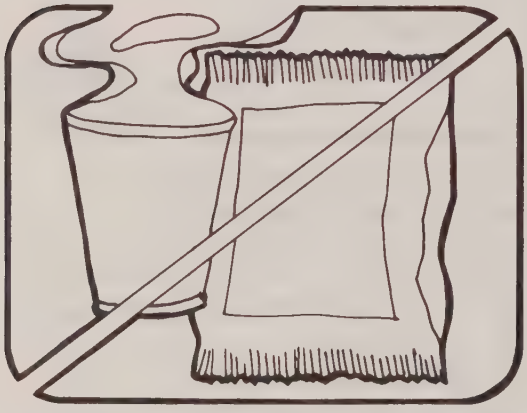
4. HANDLE S.S. DEVICES BY THE BODY



5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYROFOAM® IN WORK AREA

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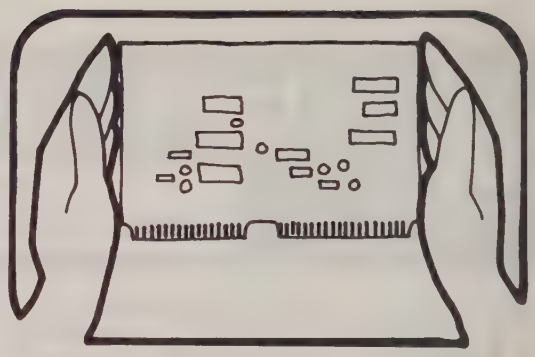
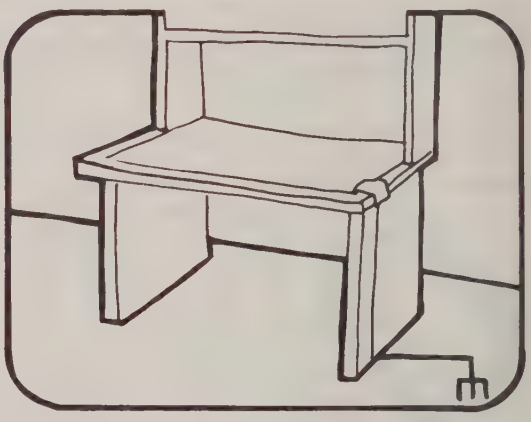
® Dow Chemical



8. WHEN REMOVING PLUG-IN ASSEMBLIES, HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR USUALLY PROVIDES COMPLETE PROTECTION TO INSTALLED SS DEVICES.



9. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION
10. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.
11. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc.. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Description
453522	6" X 8" Bag
453530	8" X 12" Bag
453548	16" X 24" Bag
454025	12" X 15" Bag
Pink Poly Sheet 30"x60"x60 Mil P/N RC-AS-1200 $20.00	Wrist Strap P/N TL6-60 $7.00

J0089B-07U7810/SE EN Litho in U.S.A.

Section 3
Access Procedures

WARNING

WHEN THE INSTRUMENT CASE COVER IS REMOVED, HAZARDOUS VOLTAGES MAY BE PRESENT. TO AVOID ELECTRICAL SHOCK, SPECIAL CARE SHOULD BE TAKEN IN THE AREA WHERE LINE POWER ENTERS THE INSTRUMENT.

3-1. INTRODUCTION

3-2. This section of the manual contains two access procedures: the Maintenance and Routine Calibration Access Procedure and the Non-Routine Calibration Access Procedure. When performing either the Line Voltage Selection or Routine Calibration Adjustments procedures, complete the Maintenance and Routine Calibration Access procedure. When performing the Non-Routine Calibration Adjustments procedure, complete the Non-Routine Calibration Access procedure.

3-3. MAINTENANCE AND ROUTINE CALIBRATION ACCESS

3-4. Complete the following procedure to gain access to the line voltage selection switches and/or the routine calibration adjustments.

1. Remove the six screws from the top case covers as shown in Figure 3-1.
2. Pull the top case cover off the instrument.
3. The line voltage selection switches cover and all routine calibration adjustments are accessible.
4. Loosen the four screws securing the line voltage selection switch cover and lift the cover straight up, if access to the switches is required.
5. For re-assembly, logically reverse this procedure.

3-5. NON-ROUTINE CALIBRATION ACCESS

3-6. Complete the following procedure to gain access to the non-routine calibration adjustments. Use Figure 3-2 for reference:

1. Remove the six screws (A) from the top case cover.
2. Pull the top case cover off the instrument.

3. Remove the four screws (B) from the top and the two screws (C) from the side of the upper guard assembly.

4. Lift the upper guard assembly off the instrument.

5. All non-routine calibration adjustments are now accessible.

6. To reassemble, logically reverse this procedure.

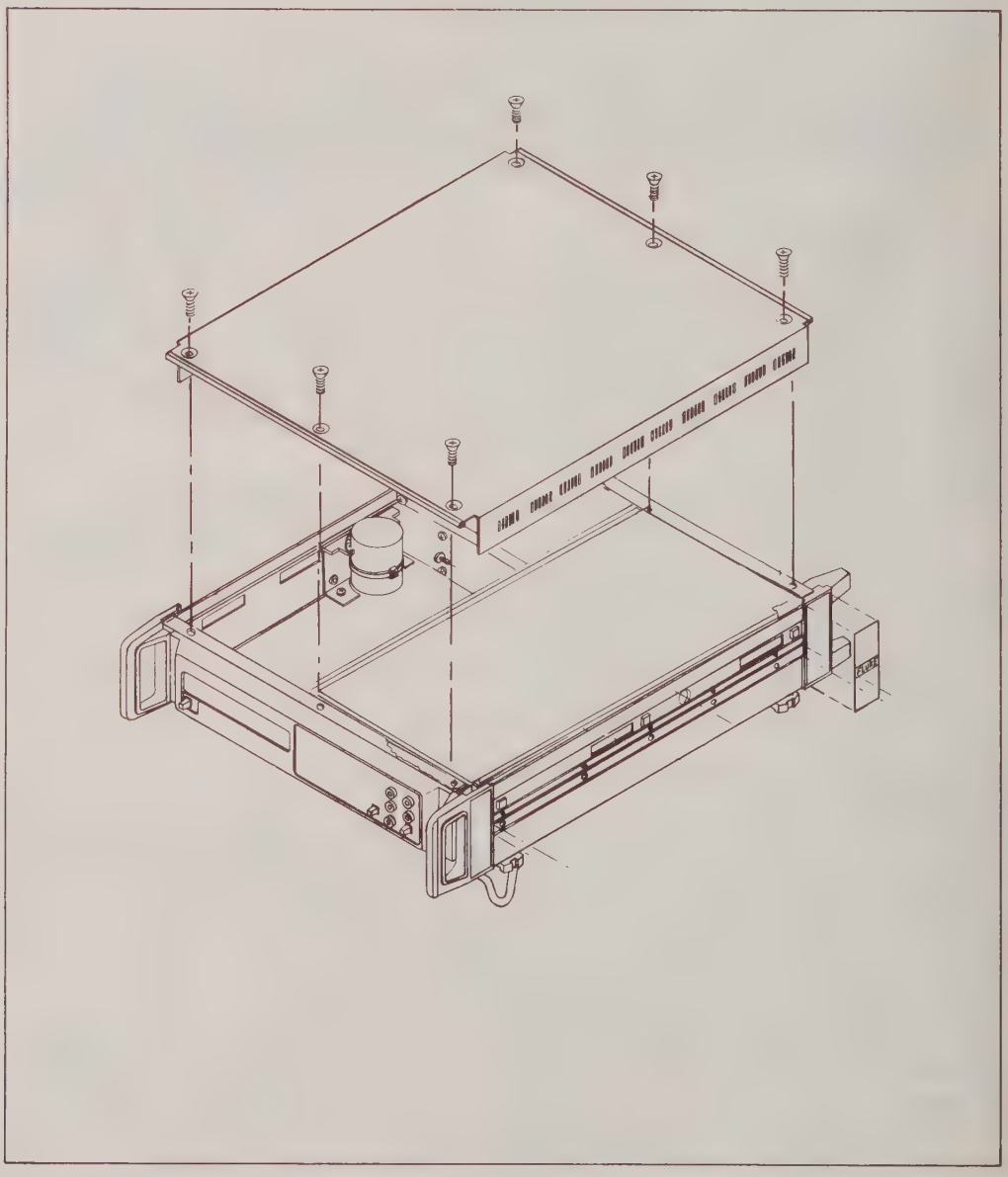


Figure 3-1. Maintenance and Routine Calibration Access

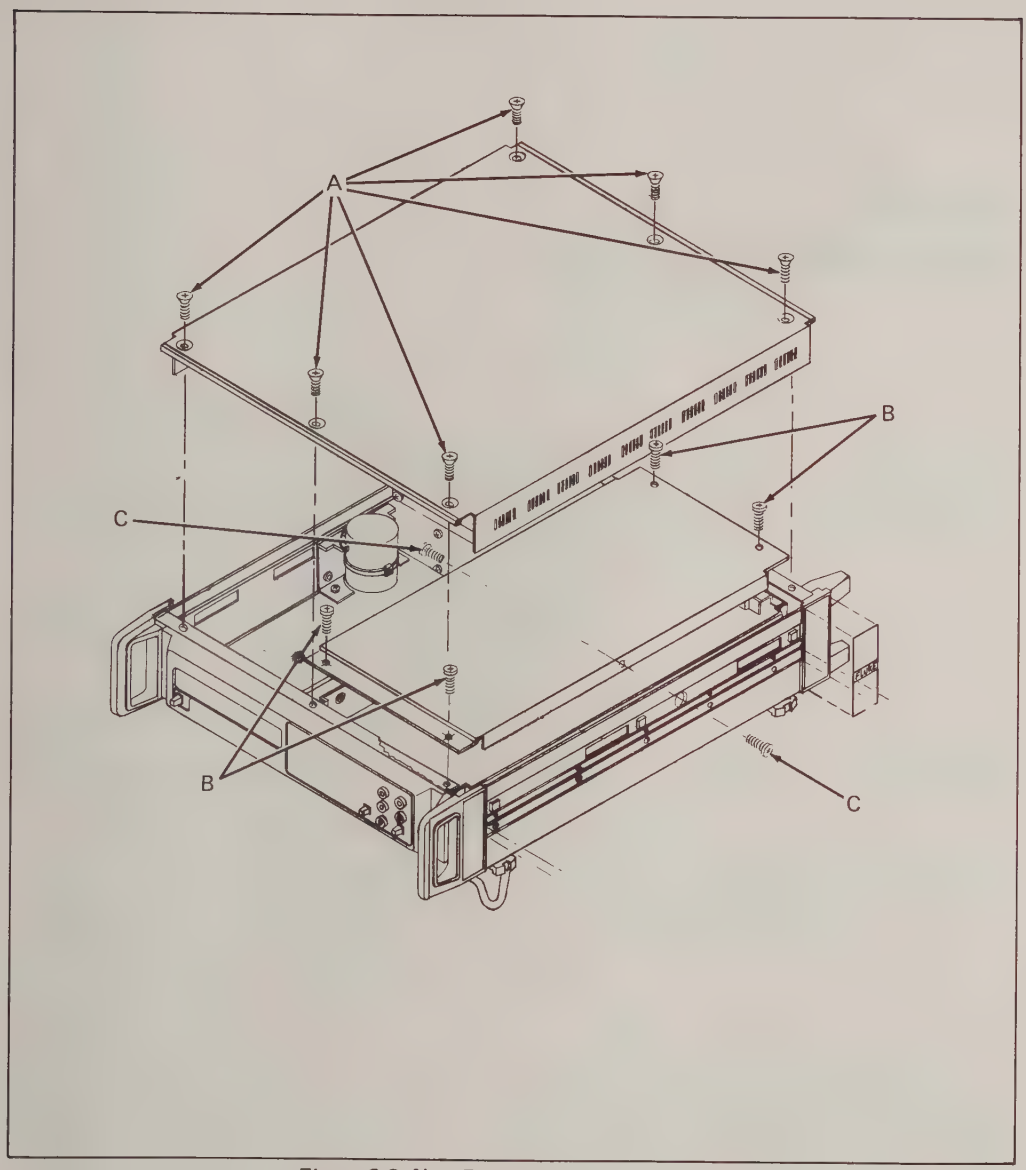


Figure 3-2. Non-Routine Calibration Access

Section 4
General Maintenance

4-1. INTRODUCTION

4-2. This section of the manual contains the general maintenance procedures. These include cleaning instructions, line voltage selection, and fuse replacement. Do no perform any of these procedures when power is applied to the instrument.

4-3. CLEANING INSTRUCTIONS

4-4. Periodically (at least every 90-days) clean the 8520A using the following procedure:

1. Insure power is remove from the 8520A.
2. Remove the top cover and guard, and the bottom cover from the instrument.
3. Clean the interior of the 8520A using low pressure, clean, dry air.
4. Clean the front panel and exterior surfaces with anhydrous ethyl alchohol or a soft cloth, dampened with a mild solution of detergent and water.

4-5. LINE VOLTAGE SELECTION

4-6. Input line voltage for the 8520A may be switch selected from one of four voltages (100, 120, 220, 240) ±10% at frequencies of 50, 60, or 400 ±5% Hertz. Two slide switches are used to select the desired line voltage. The switches are mounted on the power supply transformer located in the left rear of the instrument compartment. Figure 4-1 shows the switches set for the four possible input line voltages. Set the switches using the dot and slot as pictured. When the line voltage settings are changed insure the correct fuse is installed for the setting selected.

4-7. FUSE REPLACEMENT

4-8. Check to insure that the proper fuse is installed for the input line voltage selected. Select the applicable fuse from those listed below:

For 100 or 120V AC, use MDL ½

For 220 or 240V AC, use MDL ¼

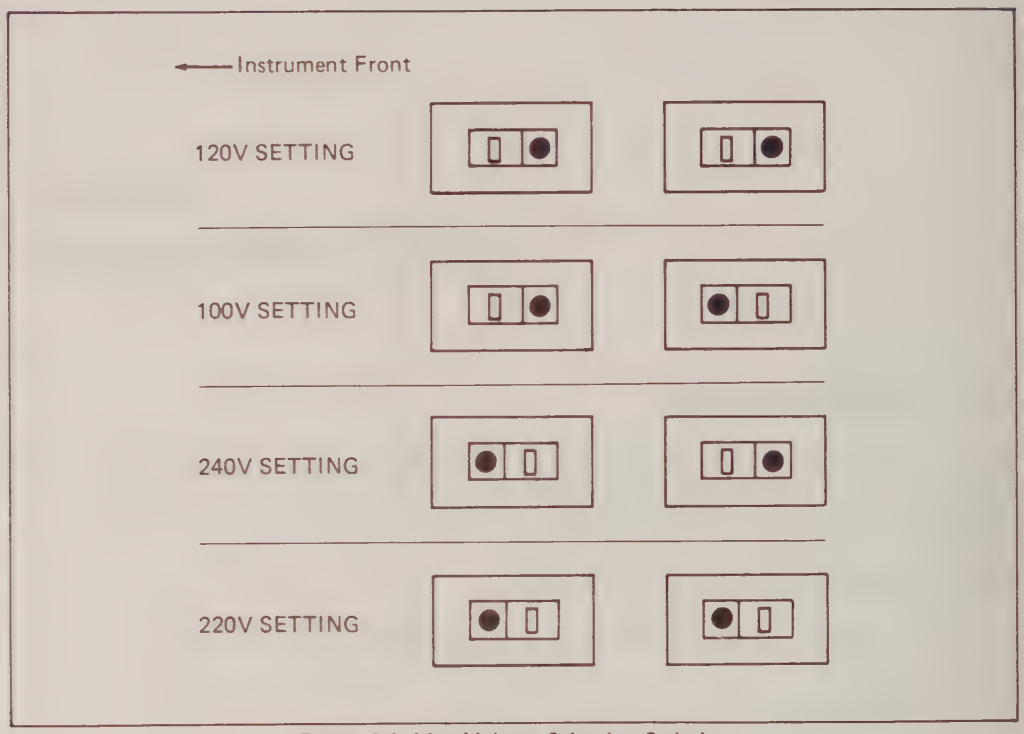


Figure 4-1. Line Voltage Selection Switches

Section 5
Performance Test

5-1. INTRODUCTION

5-2. The following paragraphs contain a performance verification test which compares the instrument's performance to the specifications given in Section 1 of this manual. The test is recommended as an acceptance test when the unit is first received, and later as a calibration procedure to verify instrument accuracy at the scheduled calibration periods, either the normal 90 days or the alternates, 24 hours or 1 year. It is also useful as an aid in troubleshooting.

5-3. Test equipment required for the performance test is listed earlier in Table 1-1. If the recommended equipment is not available, comparable instruments with equivalent specifications may be substituted. To ensure optimum results, the test must be performed at an ambient temperature of 22 to 24 degrees Celsius, with a relative humidity of less than 70%. Also, the instrument should be allowed to warm-up for at least 1 hour before starting the performance test.

5-4. If the instrument does not meet the performance test, troubleshooting, repair, and/or calibration adjustment is indicated. Procedures for calibration adjustment are given later in this manual. Troubleshooting procedures are given in the Service Manual.

5-5. EQUIPMENT PREPARATION

5-6. Perform the following procedure prior to beginning the performance test:

1. Verify the instrument is set for the applicable line voltage using the procedure previously given.
2. Install any guard or outer covers not in place.
3. Connect the instrument to the input line power.
4. Depress the POWER switch to apply line voltage to the instrument.
5. Select Front Panel inputs and NORMAL guard.
6. Allow the instrument to operate for at least 2 hours before beginning the test.

5-7. ZERO VERIFICATION

5-8. Use the following procedure to verify proper meter zeroing:

1. Select the DC Voltage Function and the 100 mV range. The 2 reading per second rate and 500 msec filter are selected automatically with the function.

2. Short the 8520A input terminals.

3. Perform steps 1 through 6 of Table 5-1.

4. Remove the short from the 8520A input terminals.

Table 5-1. Zero Verification

STEP	FUNCTION	RANGE	READING RATE	INPUT	DISPLAY READING
1	V DC	100 mV	2/sec	Short	.000 mV ±6 μV (6 digits)
2	V DC	100 mV	10/sec	Short	.000 mV ±6 μV (6 digits)
3	V DC	1V	2/sec	Short	.00000V ±20 μV (2 digits)
4	V DC	10V	2/sec	Short	.0000V ±100 μV (1 digit)
5	V DC	100V	2/sec	Short	.000V ±2 mV (2 digits)
6	V DC	1000V	2/sec	Short	.00V ±10 mV (1 digit)

5-9. DC VOLTS VERIFICATION

5-10. Use the following procedure to verify proper operation of the V DC measurement function:

1. Connect the equipment as shown in Figure 5-1.

2. Set the DC Voltage Calibrator controls for a 10V output and set the Ratio Standard to .0100000.

3. Select the DC volts function and the 100 mV range. The 2 readings per second rate and 500 msec filter are selected automatically with the function.

4. Select Operate on the DC Voltage Calibrator.

5. Perform step 1 through 10 of Table 5-2, changing the ratio standard and 8520A range settings as required. Record the displayed reading in step 10 of the table.

6. Select a Ratio Standard setting of .088888 and a DC Voltage Standard output (approximately 100 volts) that obtains the recorded display obtained in step 5 above, i.e., step 10 of Table 5-2.

7. Perform step 11 of Table 5-2, setting the Ratio Standard and 8520A range as required.

8. Disconnect the Ratio Standard from the equipment and connect the DC Voltage Standard directly to the 8520A input terminals, output HI to input HI and LO to LO.

9. Perform the steps in Table 5-3, changing the DC Voltage Standard output and 8520A range settings as required.

10. Disconnect the DC Voltage Standard from the 8520A.

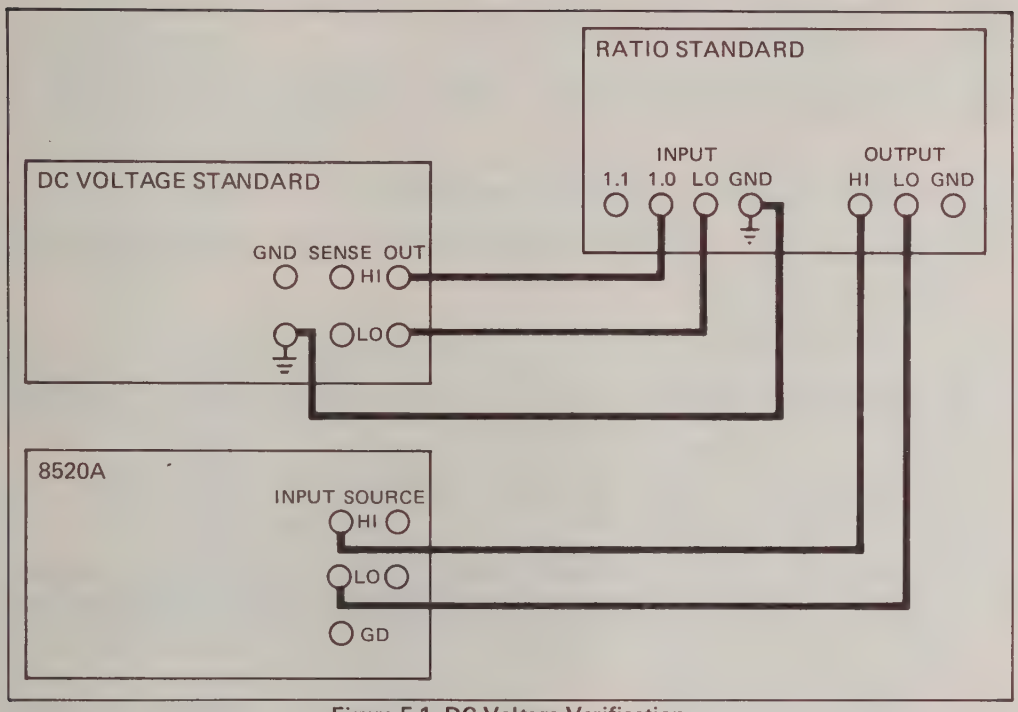


Figure 5-1. DC Voltage Verification

Table 5-2. Low DC Volts Verification

STEP	RANGE	RATIO STANDARD	INPUT	DISPLAY READING
1	100 mV	.0100000	100 mV	100 mV ±12 μV (12 digits)
2	1V	.0111110	.11111V	.11111V ±30 μV (3 digits)
3	1V	.0222220	.22222V	.22222V ±30 μV (3 digits)
4	1V	.0444440	.44444V	.44444V ±50 μV (5 digits)
5	1V	.0888880	.88888V	.88888V ±70 μV (7 digits)
6	1V	.1111110	1.11111V	1.11111V ±90 μV (9 digits)
7	10V	.111110	1.1111V	1.1111V ±.2mV (2 digits)
8	10V	.222220	2.2222V	2.2222V ±.2 mV (2 digits)
9	10V	.444440	4.4444V	4.4444V ±.3 mV (3 digits)
10	10V	.888880	8.8888V	8.8888V ±.5 mV (5 digits)
11	10V	.111111	11.1111V	11.1111V ±.7 mV (7 digits)

Table 5-3. High DC Volts Verification

STEP	DC VOLTAGE STANDARD OUTPUT	8520A RANGE	DISPLAY READING
1	11.111V	100V	11.111V ±3 mV (3 digits)
2	22.222V	100V	22.222V ±4 mV (4 digits)
3	44.444V	100V	44.444V ±5 mV (5 digits)
4	88.888V	100V	88.888V ±8 mV (8 digits)
5	111.111V	100V	111.111V ±10 mV (10 digits)
6	111.11V	1000V	111.11V ±20 mV (2 digits)
7	222.22V	1000V	222.22V ±20 mV (2 digits)
8	444.44V	1000V	444.44V ±40 mV (4 digits)
9	888.88V	1000V	888.88V ±70 mV (7 digits)
10	1000.00V	1000V	1000.00V ±80 mV (8 digits)

5-11. RESISTANCE VERIFICATION

5-12. Use the following procedure to verify proper operation of the resistance measurements functions:

1. Select the Ω 4-wire function and 10Ω range. Select one reading per second, which automatically selects the 1000 msec filter.

2. Short the V/Ω INPUT HI and LO leads, the Ω SOURCE HI and LO leads and then connect the shorted leads with a jumper.

3. The 8520A display reads .0000 ±0.7 mΩ (7 digits).

4. Select the 2 readings per second rate, which automatically selects the 500 msec filter.

5. Perform steps 1 through 7 of Table 5-4, applying the Standard Resistance, and selecting the listed 8520A range.

6. Compute the value of the 10 MΩ standard resistor in nano-siemens by dividing 1 by the corrected standard value, i.e., take the reciprocal of the corrected standard value. The result should be approximately 100 nS.

7. Perform step 8 of Table 5-4.

8. Disconnect the Standard Resistor from the 8520A.

Table 5-4. Resistance Verification

STEP	NOMINAL STANDARD RESISTOR VALUE	8520A RANGE	CORRECTED STANDARD VALUE READING ± TOLERANCE
1	10Ω	10 ohm	10Ω ±1.5 mΩ (15 digits)
2	100Ω	100 ohm	100Ω ±9 mΩ (9 digits)
3	1000Ω	1000 ohm	1000Ω ±90 mΩ (9 digits)
4	10 kΩ	10 kohm	10 kΩ ±.9Ω (9 digits)
5	100 kΩ	100 kohm	100 kΩ ±11Ω (11 digits)
6	1 MΩ	1 Mohm	1 MΩ ±180Ω (18 digits)
7	10 MΩ	10 Mohm	10 MΩ ±5 kΩ (5 digits)
8	10 MΩ	100 nS	100nS ± .10nS (10 digits)

5-13. AC VOLTAGE VERIFICATION

5-14. Use the following procedure to verify proper operation of the V AC function:

1. Select the AC Volts function and the 1 volt range. The 2 readings per second rate and 500 msec filter are selected automatically with the function.

2. Connect the AC Calibrator output to the 8520A input terminals.

3. Perform step 1 through 15 of Table 5-5, setting the AC Calibrator output, and 8520A range as required.

4. Disconnect the AC Calibrator from the 8520A.

5. Connect the AC Calibrator/Power Amplifier combination output to the 8520A input terminals.

6. Perform steps 16 through 19 of Table 5-5, setting the AC Calibrator output, and 8520A range as required.

7. Disconnect all test equipment from the 8520A.

8. This completes the performance test of the 8520A.

Table 5-5. AC Voltage Verification

STEP	AC CALIBRATOR OUTPUT		8520A RANGE	DISPLAY READING BETWEEN:
	VOLTAGE	FREQUENCY		
1	1.100000V	40.00 Hz	1V	1.09830 – 1.10170 (170 digits)
2	1.000000V	20.00 kHz	1V	0.99840 – 1.00160 (160 digits)
3	1.000000V	100.00 kHz	1V	0.98400 – 1.01600 (1600 digits)
4	1.000000V	300.00 kHz	1V	0.96400 – 1.03600 (3600 digits)
5	1.000000V	1.000 MHz	1V	0.87000 – 1.1300 (13,000 digits)
6	2.00000 mV	20.000 kHz	1V	.00140 – .00260 (60 digits)
7	10.00000V	1.0000 kHz	10V	9.9852 – 10.0148 (148 digits)
8	10.00000V	20.000 kHz	10V	9.9852 – 10.0148 (148 digits)
9	10.00000V	100.00 kHz	10V	9.8520 – 10.1480 (1480 digits)
10	10.00000V	300.00 kHz	10V	9.6640 – 10.3360 (3360 digits)
11	10.00000V	1.0000 MHz	10V	8.8000 – 11.2000 (12000 digits)
12	100.0000V	1.0000 kHz	100V	99.861 – 100.139 (139 digits)
13	100.0000V	20.000 kHz	100V	99.861 – 100.139 (139 digits)
14	100.0000V	100.00 kHz	100V	98.610 – 101.390 (1390 digits)
15	50.0000V	200.00 kHz	100V	48.020 – 51.980 (1980 digits)
16	600.0000V	1.0000 kHz	1000V	599.10 – 600.90 (90 digits)
17	600.0000V	20.000 kHz	1000V	599.10 – 600.90 (90 digits)
18	600.0000V	30.000 kHz	1000V	590.93 – 609.07 (907 digits)
19	100.0000V	100.00 kHz	1000V	95.93 – 104.07 (407 digits)

Section 6
Calibration Adjustments

6-1. ROUTINE CALIBRATION ADJUSTMENTS

6-2. Introduction

6-3. The calibration adjustment procedures given in the following paragraphs should be performed after repair of the 8520A and or when the unit fails the performance-test requirements. If the unit will not respond to, or meet the limits of the adjustment procedures, troubleshooting and repair is indicated. Equipment required for the calibration adjustments is listed earlier in Table 1-1.

6-4. All calibration adjustments are accessible when the top cover is removed from the 8520A. The locations of the assemblies, test points, and adjustments that must be accessed to complete the routine calibration adjustment procedures are placarded on the instrument guard cover.

6-5. To ensure optimum results, the calibration adjustments must be performed at an ambient temperature of 22 to 24 degrees Celsius, with a relative humidity of less than 85%. Also the unit should be allowed to warm-up for at least 1 hour before starting the adjustments procedures.

6-6. Instrument accuracies during the first 24 hours after calibration and for one year after calibration are given in the instrument specification. If accuracies within either of these levels are desired the calibration interval can be adjusted accordingly.

6-7. The 8520A contains three calibration procedures (+5V Power Supplies, Ref Amp, and Auto Zero) that are performed at the factory and do not require further adjustment unless components are replaced within the circuit. These adjustments and the special handling required, are detailed at the end of the calibration procedure in a paragraph titled "Non-Routine Calibration Adjustments".

6-8. Calibration (Cal) Digit

6-9. When selected, the Cal digit appears at the left position of the alphanumeric display to add an additional digit of resolution. This moves the displayed data one position to the right, truncating the right character. The Cal digit is used in the calibration of the dc volt and ohms features. It is switch selectable with an internal push-push switch and is accessable only with the top cover removed.

6-10. Designated S1 on the Digital PCB, the switch causes the Cal digit feature to change states, enabling it if it had been disabled, or disabling it if it had been enabled. The Cal digit feature is automatically disabled if power is removed or a RESET occurs.

Depression of the switch is required to re-enable the feature. The Cal digit feature cannot be selected in remote operation.

6-11. Routine Calibration Preparation

6-12. Prepare the 8520A for routine calibration using the following procedure:

1. Perform the Routine Calibration Access procedure given in Section 3.

NOTE

Do not remove the inner guard cover for a routine calibration.

2. Apply power to the 8520A and allow the instrument to warm-up for 1 hour before beginning the adjustment procedure.

NOTE

The ambient temperature during the warm-up period and the subsequent calibration should be between 22° C and 24° C with the relative humidity less than 70%.

6-13. Reference Supply

6-14. Use the following procedure to perform calibration adjustments on the Reference Supply:

1. Connect the test DMM to TP504 (HI) and TP501 (LO).

2. Depress the RESET keyswitch twice, holding it depressed the second time, short the instrument input terminals. Maintain this condition until the adjustment procedure is complete.

3. Adjust R503 POS REF for a test DMM reading of +6.5000V dc.

4. Connect the test DMM to TP501 (HI) and TP503 (LO).

5. Adjust R504 NEG REF for a test DMM reading of +6.5000V dc.

6. Release the RESET keyswitch and remove the test DMM from the instrument.

6-15. A/D Converter

6-16. Use the following procedure to complete the A/D Converter calibration adjustments:

1. Select the dc volts function, the 10V range, the 2 reading/sec rate, the 1000 msec filter, and the Cal digit feature, in that sequence.

2. Short the instrument input terminals.

3. Adjust R513 for an instrument display of .0000 0 ±2 Cal digits.

4. Connect the equipment as shown in Figure 6-1, i.e., with the DC Calibrator output connected to the Ratio Standard input LO, and the DC Calibrator output LO to the Ratio Standard 1.0 input.

5. Set the Ratio Standard to .8100000.

6. Select a +10.00000V DC Calibrator output.

7. Adjust R522 for an instrument display of –8.1000 0 ±2 Cal digits.

8. Set the DC Calibrator to STANDBY then reverse the output leads at the DC Calibrator. Return the DC Calibrator to OPERATE to obtain an instrument input of +8.1000 0V dc.

9. Adjust R504 for an instrument display of +8.1000 0 ±2 Cal digits.

10. Perform steps 6 through 9 until both readings are within the stated tolerance without adjustment.

11. Perform the checks and adjustments in Table 6-1.

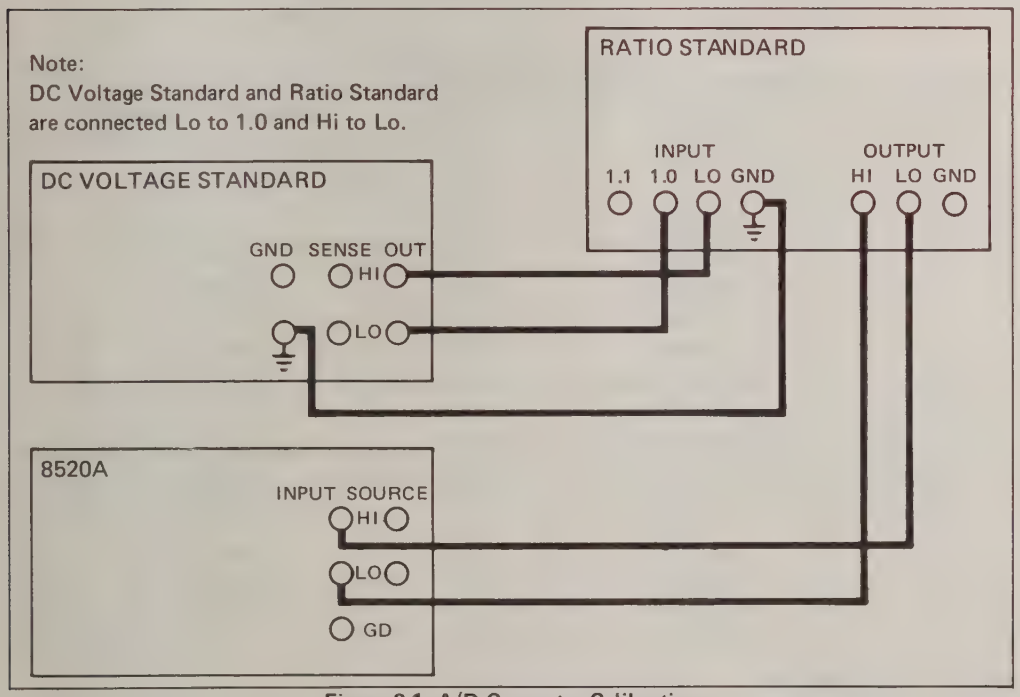


Figure 6-1. A/D Converter Calibration

Table 6-1. A/D Converter Calibration

	VOLTAGE CALIBRATOR SETTING	RATIO STD. SETTING	8520A INPUT	ADJUSTMENT	DISPLAY ± CAL DIGITS
1	+10V	.4100000	4.1V	R521	4.1000 0 ±2
2	+10V	.2100000	2.1V	R520	2.1000 0 ±2
3	+10V	.1100000	1.1V	R519	1.1000 0 ±2
4	+10V	.0600000	0.6V	R518	.6000 0 ±2
5	+10V	.0300000	0.3V	R527	.3000 0 ±2

12. Select a ratio standard setting of 0.0800000 and a DC Voltage Calibrator output of 100V dc.

13. Adjust the DC Voltage Calibrator for an 8520A display of 8.0000 0 ±2 Cal digits.

14. Verify the display readings in Table 6-2. These are no adjustments for these readings.

15. Set the DC Calibrator to STANDBY then reverse the DC Calibrator output leads. Return the DC Calibrator to OPERATE to obtain a negative input to the 8520A.

16. Repeat the steps in Table 6-2 and verify that the readings are as shown, but of a negative polarity.

17. Depress the CAL switch to disable to the CAL Digit feature.

18. Disconnect the test equipment from the instrument.

Table 6-2. A/D Converter Tests

STEP	RATIO STANDARD SETTING	8520A INPUT	DISPLAY ± CAL DIGITS
1	.0100000	1.0V	1.0000 0 ±2
2	.0200000	2.0V	2.0000 0 ±2
3	.0300000	3.0V	3.0000 0 ±4
4	.0400000	4.0V	4.0000 0 ±2
5	.0500000	5.0V	5.0000 0 ±4
6	.0600000	6.0V	6.0000 0 ±6
7	.0700000	7.0V	7.0000 0 ±6
8	.0800000	8.0V	8.0000 0 ±2
9	.0900000	9.0V	9.0000 0 ±8
10	.1000000	10.0V	10.0000 0 ±10
11	.1100000	11.0V	11.0000 0 ±12
12	.1200000	12.0V	12.0000 0 ±15
13	.1300000	13.0V	13.0000 0 ±15
14	.1400000	14.0V	14.0000 0 ±15
15	.1500000	15.0V	15.0000 0 ±15
16	.1600000	16.0V	16.0000 0 ±15

6-17. DC Buffer

6-18. Use the following procedure to complete the DC Buffer calibration adjustments:

1. Short the 8520A input terminals.

2. Select the volts dc function and the 100 mV range.

3. Select the 2 readings per second rate, which automatically selects the 500 msec filter.

4. Adjust C231 for a reading of .000 mV ±1 μV.

5. Select the 10 readings per second rate, which automatically selects the 100 msec filter.

6. Adjust C225 for equal alternations between the plus and minus signs.

7. Repeat steps 3 through 6 until both readings are within the stated tolerance without adjustment.

8. Remove the short on the input terminals and replace it with the 1 MΩ/1 μF parallel load.

9. Select the 2 readings per second rate then verify that the instrument displays .000 mV ±50 μV.

10. Remove the load from the input terminals.

11. Connect the 8520A to the DC Calibrator and Ratio Standard as shown in Figure 5-1 for a positive input to the 8520A.

12. Select a DC Voltage Calibrator output of 10V and set the Ratio Standard to .0190000.

13. Adjust R253 for an 8520A display reading of 190.000 mV ±2 digits.

14. Select the 1 volts range and the Cal digit feature on the 8520A.

15. Set the Ratio Standard to .190000.

16. Adjust R251 for an 8520A display reading of 1.90000 0 ±6 Cal digits.

17. Set the DC Calibrator to STANDBY and remove the ratio standard from the circuit, connecting the DC Calibrator directly to the 8520A for a positive input, i.e., HI to HI and LO to LO.

18. Select the 100 volts range on the 8520A.

19. Select a DC Voltage Calibrator output of 120.000V dc.

20. Adjust R109 for an 8520A display reading of 120.000 0 ±6 Cal digits.

21. Disconnect the DC Calibrator from the 8520A.

6-19. Ohms Converter

6-20. Complete the Ohms Converter calibration adjustments by performing, in sequence, each step in Table 6-3. Manually select the range indicated and short the input in step 1 at the far end of the input leads. When the adjustments are complete depress the CAL digit switch to disable the CAL digit feature.

Table 6-3. Ohms Converter Calibration

STEP	FUNCTION	RANGE IN OHMS	READING RATE	FILTER	STANDARD RESISTOR INPUT	ADJUSTMENT	DISPLAY ± CAL DIGIT
1	Ω4 WIRE	10	2/sec	500msec	Short	R325	.0000 0 ±20
2	Ω4 WIRE	10k	2/sec	500msec	10k	R311	10.0000 0 ±15
3	Ω4 WIRE	1000	2/sec	500msec	1k	R314	1.00000 0 ±15
4	Ω4 WIRE	100	2/sec	500msec	100	R317	100.000 0 ±15
5	Ω2 WIRE	100k	2/sec	Fast	100k	R315	100.000 0 ±20
6	Ω2 WIRE	1M	1/sec	Slow	1M	R319	1.00000 0 ±20

6-21. AC Converter

6-22. Use the following procedure to complete the AC Converter calibration procedures:

1. Select the AC plus DC function and the 1 volt range. The 2 readings per second rate and 500 msec filter are selected automatically with the function.

2. Short the 8520A input terminals.

3. Connect a test DMM set for the 100 mV dc range to J418 (HI) and TP402 (LO).

NOTE

TP402 is not placarded on the guard cover, however, it is accessible through the J418 or R440 slots.

4. Adjust R408 for a test DMM reading of 0.000 mV ±15 μV (15 digits). Record the reading.

5. Remove the short from the input terminals and the test DMM from the circuit.

NOTE

J418 is a removable jumper. Exercise caution removing the DMM probe from the jumper.

6. Connect a DC Voltage Standard to the 8520A input terminals for a negative input. The 8520A remains in the AC plus DC function and 1 volt range previously selected.

7. Perform steps 1 and 2 of Table 6-4. Repeat until both steps are within the stated tolerance without further adjustment.

8. Perform step 3 and 4 of Table 6-4. Repeat step 1 through 4 of the table until all are within the listed tolerance without further adjustment.

9. Select the AC voltage function and the 1 volt range. The 2 readings per second rate and 500 msec filter are selected automatically with the function.

10. Repeat steps 1 through 5 of the procedure, adjusting R408 for the reading recorded in step 4.

11. Connect an AC Voltage Calibrator output to the 8520A input terminals.

12. Perform steps 1 through 8 of Table 6-5.

13. Remove the test equipment from the instruments.

14. The calibration procedure is complete.

Table 6-4. AC Converter AC + DC Calibration

STEP	INPUT	ADJUSTMENT	READING
1	−.0040000	R463	−.00400V ±50 μV (5 digits)
2	+.0040000	R445	+.00400V ±50 μV (5 digits)
3	−1.000000	—	Record Reading
4	+1.000000	R440	Recorded Reading ±200μV (20 digits)

Table 6-5. AC Converter AC Calibration

STEP	RANGE	INPUT	ADJUSTMENT	DISPLAY
1	1V	1.6V ac @ 200 Hz	R481	1.60000V ±80 μV (8 digits)
2	10V	11V ac @ 200 Hz	R422	11.0000V ±600 μV (6 digits)
3	100V	100V ac @ 200 Hz	R433	100.000V ±6 mV (6 digits)
4	1000V	600V ac @ 200 Hz	R438	600.00V ±60 mV (6 digits)
5	1000V	600V ac @ 20 kHz	C403	600.00V ±150 mV (15 digits)
6	1V	1.6V ac @ 20 kHz	C408	1.60000V ±120 μV (12 digits)
7	10V	11V ac @ 20 kHz	R425	11.0000V ±1.2 mV (12 digits)
8	100V	110V ac @ 20 kHz	R426	110.000V ±12 mV (12 digits)

6-23. NON-ROUTINE CALIBRATION ADJUSTMENTS

6-24. Introduction

6-25. The Calibration adjustments listed in the following sub-paragraphs are non-recurring in nature and should be performed only when a component has been changed in the applicable circuit. The others may be verified, if desired, at that time.

6-26. Preparing for Non-Routine Calibration

6-27. Allow a 2 hour warm-up period before beginning any of the procedures, then complete the Non-Routine Calibration Access procedure in Section 3 and perform the adjustments. When the procedure is complete replace the inner guard cover and allow the operating temperature to stabilize with an additional 30 minute warm-up period before doing a Performance Test or Routine Calibraton Adjustment.

6-28. Power Supply

6-29. Use the following procedure to complete the Power Supply calibration adjustments:

1. Connect the test DMM set for approximately 5V dc to TP201 (HI) and TP202 (LO) on the digital assembly.

2. Adjust R204 for a reading between +4.9 and +5.2V dc.

3. Transfer the test DMM leads to TP701 (HI) and TP702 (LO) on the Analog Assembly.

4. Adjust R710 for a reading between +4.9 and +5.2V dc.

5. Remove the test equipment from the instruments.

6-30. Auto Zero

6-31. Use the following procedure to complete the Auto Zero Calibration Adjustments:

1. Short the instrument input terminals.

2. Select volts dc, 100 mV range, and the 2 reading/sec rate (which automatically selects the 500 msec filter).

3. Connect an oscilloscope between TP206 and TP207 (ground).

4. Adjust R236 for an oscilloscope display with the squarewave amplitude less than 10 mV peak-to-peak as shown in Figure 6-2. (Suggested initial oscilloscope settings are 20 ms/cm and 100 mV/div, then adjust for at least two repitions of the waveform).

NOTE

The 10 mV waveform measurement is made on the body of the squarewave; ignore the spikes.

5. Remove test equipment from the instrument.

6-32. Reference Amplifier

6-33. Some units have a small PCB assembly installed in the A/D Converter section in place of U501. Two different configurations of the assembly are used, one parallel and the other perpendicular to the Analog Assembly; however, both are electrically identical. When the Ref Amp assembly is installed use the following procedure to re-adjust the circuit if any component in it is changed. If either U2, R15, or R16 fail, they must be replaced as a matched set.

1. Connect a test DMM to the cathode CR1 (HI) on the Ref Amp Assembly and TP501 (LO) on the A/D Converter section of the Analog Assembly.

NOTE

The point monitored is the electrical junction of R1, R2, R3, R15, and the cathode of CR1.

2. Adjust R3 on the Ref Amp Assembly for a DMM reading of 11V dc ±20 mV dc.

3. Remove the test equipment from the instrument.

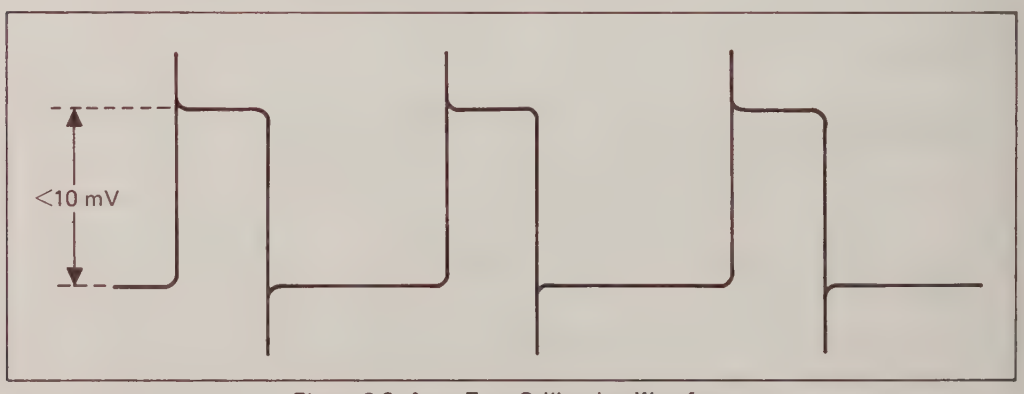


Figure 6-2. Auto Zero Calibration Waveform

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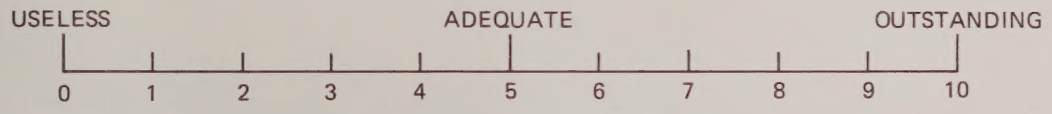

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